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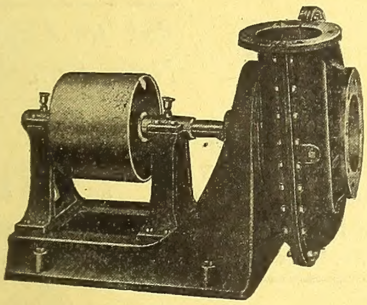
Vol. 27 Toronto, July 2, 1913 No. 27

ESTABLISHED 1886

Contract Record and Engineering Review



Steam and Power Pumps
Condensers, Travelling Cranes

The Smart-Turner Machine Co. LIMITED
HAMILTON, CANADA

"MADE IN CANADA"

Bent Glass

Made in all
Kinds of
Glass
on Short
Notice

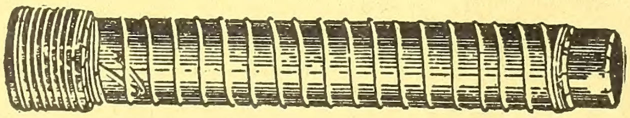
Large Bent Plate Glass for Shop
Fronts a Specialty

The Toronto Plate Glass Importing Company, Limited
(HILL & RUTHERFORD, Managing Directors)
Head Office and Works: 91 to 133 Don Roadway
TORONTO

Air Compressors
OF BELLISS MAKE
have gained their reputation for

- Simplicity of Design
- Noiseless Running
- Compact Design
- Low Oil Consumption
- Continuous Operation
- Overall Efficiency

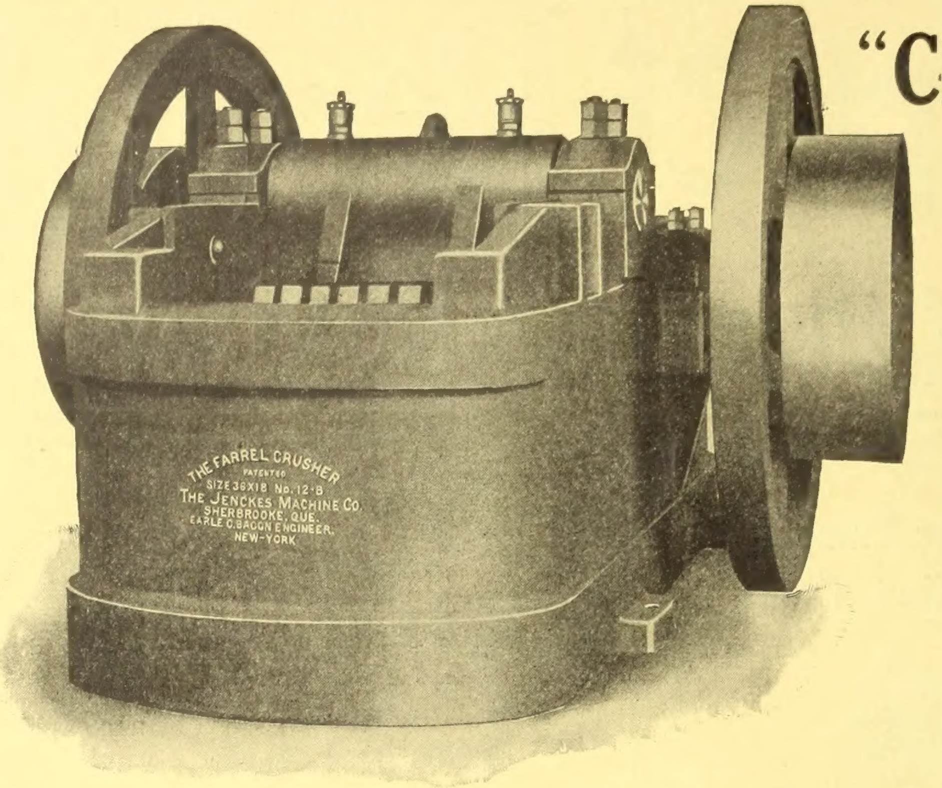
Messrs. Belliss & Morcom, Ltd.
BIRMINGHAM, ENGLAND
Agents
Laurie & Lamb
Board of Trade Building, MONTREAL



Continuous and Machine Banded Wood Stave
WATER PIPE
RESERVOIR TANKS
for city and town Water Systems,
Fire Protection, Power Plants,
Hydraulic Mining, Irrigation, etc.
One-half the cost of Iron Pipe—
and better.

Pacific Coast Pipe Co., Limited
P. O. Box 563 Vancouver, B. C.
Office and Factory, Granville St., near High Bridge
WRITE FOR CATALOGUE
Full Particulars and Estimates Furnished

Alphabetical Index of Advertisers, Page 16 Classified Directory to Advertisements, Page 6



"CRUSHERS"

Complete Crushing Plants

Our Specialty

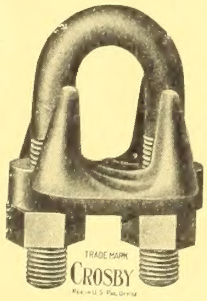
Many Years Experience and Exceptional Facilities

Ask for Copy of New Catalogue

THE JENCKES MACHINE COMPANY, LIMITED

General Offices: Sherbrooke, Que. Works: Sherbrooke, Que. - St. Catharines, Ont.

Sales Offices:—Sherbrooke, Montreal, St. Catharines, Cobalt, So. Porcupine, Vancouver, Nelson



IF YOU ARE A CONTRACTOR

Using Wire Rope

YOU NEED THE

GENUINE "CROSBY" CLIP

IT HOLDS

Drop forged steel—Galvanized, cannot break, slip nor rust. Has nine times the strength of cast clips.

Made By

American Hoist & Derrick Co.

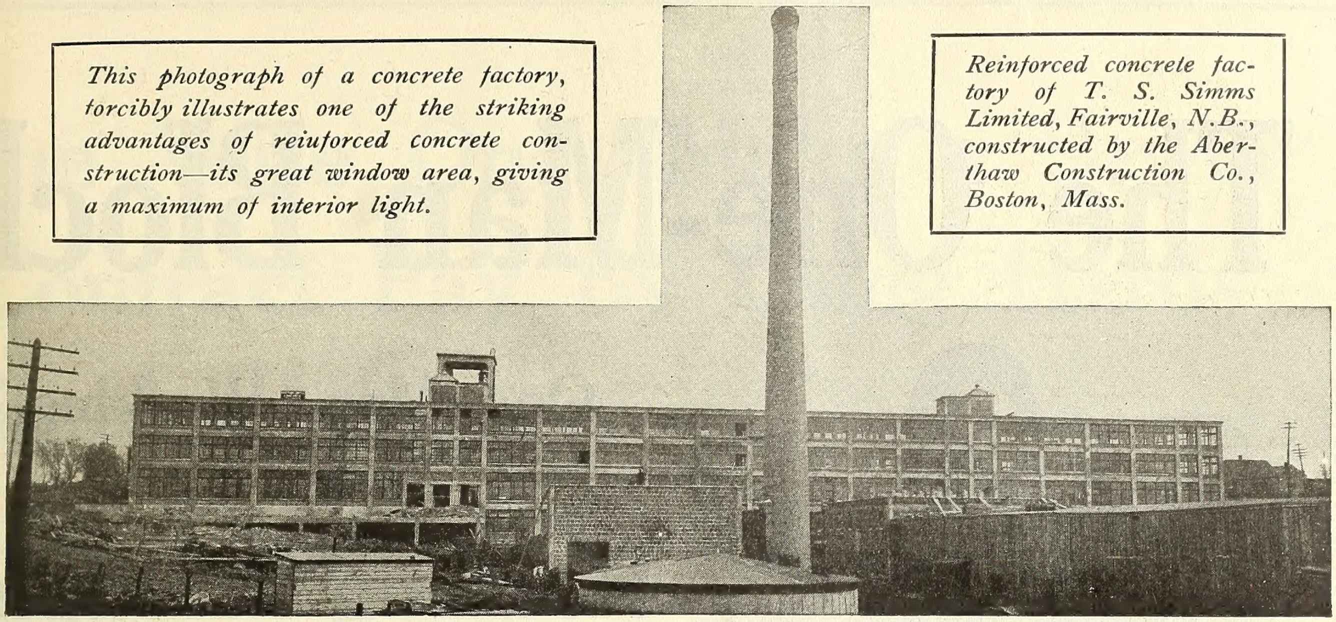
St. Paul, Minn.

Sold By

Dominion Wire Rope Co , Limited.—Montreal, Can.
General Supply Co. of Canada, Ltd., Montreal, Ottawa, Toronto, Canada.
Stuart Machinery Co.—Winnipeg, Man.
Vancouver Machinery Depot, Ltd.—Vancouver, B. C.
Gorman, Clancey & Grindley—Edmonton and Calgary Alta., and Nelson, B. C.

This photograph of a concrete factory, forcibly illustrates one of the striking advantages of reiuforced concrete construction—its great window area, giving a maximum of interior light.

Reinforced concrete factory of T. S. Simms Limited, Fairville, N.B., constructed by the Aberthaw Construction Co., Boston, Mass.



Concrete Factories are Most Efficient

The efficiency of a machine is the ratio of the amount of work a machine does to the amount of work required to operate it. The output is equal to the input minus the work lost or wasted. The less wasted the greater the efficiency.

In the same way the efficiency of a factory may be defined as the ratio of output to input. Output financially, is increased by reducing unnecessary expenses.

Concrete Stops Wastes

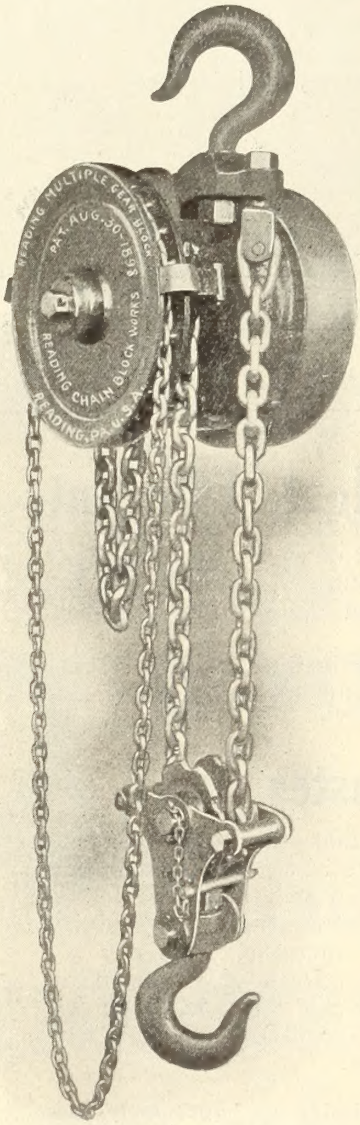
Concrete buildings are proof against fire, water and vermin. They give the maximum light and are sanitary. They resist vibration, and are permanent and durable.

Fire-proofness reduces insurance rates. Water or liquids used in certain processes will not leak through floors to destroy valuable goods below. Rats and other vermin find no place to live in a concrete building, thus eliminating losses from this cause. Maximum light and sanitary conditions increase efficiency of employees. Lack of vibration reduces wear and tear on machines. Permanency and durability reduce depreciation.

The way in which concrete stops these leaks is fully described in our handsomely illustrated 224 page book, "Factories and Warehouses of Concrete." It contains photographs and data of factories and warehouses for all classes of industries.

You can have a copy free if you will mention this advertisement.

Canada Cement Company
Limited
Montreal



The One-Man Block

One Man, Working with a

Reading Multiple Gear Chain Block

will do more work, and do it more easily, than with any other Chain Block on the market.

Try one in comparison with the Block you now have, and be convinced.

They are the only Chain Block whose entire working parts are protected by a dust-proof casing and operate in a bath of oil.

Carried in Stock

Montreal, 318 St. James St.
Toronto, 155 West Richmond St.
Cobalt, opp. Right of Way Mine.
Winnipeg, 259-261 Stanley St.

MUSSENS

The Wise Ones Make a Sewer Contract Pay By Using Hardy

Simplex Hammer Drills

If your contract is big enough put in a gasoline compressor plant and use Air Hardys, or for a small job put in a Steam Driven Hardy.

Satisfaction Guaranteed

Just Try One

Five Hardy's in a row. There are eleven on this one job

LIMITED

Calgary, 10th Ave. & 3rd St. E.
Vancouver, 365 Water Street
Quebec, 71 Maple Ave.
St. John, N.B., 57 Smythe St.
Halifax, 78 Granville St.

CLASSIFIED INDEX TO ADVERTISEMENTS

The following regulations apply to all advertisers:—Eighth page, two headings quarter page, four headings; half page, eight headings; full page, sixteen headings.

Air Compressors
Canadian Allis-Chalmers, Limited.
Canadian Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd.
Escher Wyss & Co.

Architects
Weeks, Arthur L.

Architects' Instruments
Stanley Co., W. F.
Ainsworth & Sons, Wm.
W. & L. E. Gurley.

Architectural Iron Work
Canadian Allis-Chalmers, Limited.
Canada Wire & Iron Goods Co.
Dennis Wire & Iron Works.
Dom. Ornamental Iron Works.
McGregor & McIntyre
Meadows Co. Geo. B.
Steel & Radiation Ltd.

Architectural Metal Works
Metal Shingle & Siding Co.
Metallic Roofing Co.

Architectural Terra Cotta
Black Building Supply Co., Ltd.
Don Valley Brick Works.
Gibbs & Canning.
Northwestern Terra-Cotta Co.
Toronto Plate Glass Imp't'g Co.

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Asphalt & Supply Co.
Barber Asphalt Paving Co.
Canadian Mineral Rubber Co.

Belting
Can. Consolidated Rubber Co.
Goodyear Tire & Rubber Co.
Can. Fairbanks-Morse Co.
Dominion Belting Co.

Blowers
Canadian Buffalo Forge Co.
Can. Ingersoll-Rand Co., Ltd.
Canadian Sirocco Co.
Douglas Milligan Co.
Sheldons Limited
Sturtevant Co. of Can. Ltd., B. F

Boilers
Berg Machinery Mfg. Co.
Canadian Allis-Chalmers, Limited.
Boving Company of Canada.
Inglis Co., John.
Jenckes Machine Co.
Leonard & Sons, E.
Marsh & Henthorn.
McDougall Caledonian Iron Wks.
Mussens Limited.
Waterous Engine Works Co.

Boxes—Junction.
Standard Underground Cable Co. of Canada Limited.

Brewers' Machinery
Linde British Refrigeration Co.

Brick
American Enamelled Brick Co.
Black Building Supply Co., Ltd.
Bradford Pressed Brick Co.
Douglas Milligan Co.
Don Valley Brick Works.
Hamilton Pressed Brick Works.
North-Western Terra Cotta Co.
Nova Scotia Clay Works.
Sydney Pressed Brick Co.

Brick Chimneys
Canadian Kellogg Co.
Douglas Milligan Ltd.
Heinicke Co., H. R.

Brick Machinery and Supplies
Bechtels Limited
Berg Machinery Mfg. Co.
Sheldons Limited

Brick Dryers
Bechtels Limited.
Berg Machinery Mfg. Co.
Canadian Buffalo Forge Co.

Bridges (Steel)
Canadian Allis-Chalmers, Limited.
Canadian Bridge Co.
Chicago Bridge & Iron Works.
Des Moines Bridge and Iron Co.
Dickson Bridge Works.
Dominion Bridge Co.
Hamilton Bridge Works Co.
Mackinnon-Holmes & Co.
McNeil & Co., W. P.
National Bridge Co.
Phoenix Bridge & Iron Works.
Sarnia Bridge Co.
Scherzer Rolling Lift Bridge Co.
Structural Steel Co.
Standard Steel Construction Co.

Buckets
American Hoist & Derrick Co.
Browning Engineering Co.
Canadian Fairbanks-Morse Co.
Lecky & Collis.
Thew Shovel Company.

Cable
Canada Wire & Cable Co.
Imperial Wire & Cable Co.
Standard Underground Cable Co. of Canada, Limited.

Cement
Alsen Portland Cement Co.
Britnell & Co.
Bremner, Alex.
Canada Cement Co.
McNally & Co., W.
Morrison & Co., T. A.
Ontario Lime Co., Ltd.
Rogers, Alfred Limited
Smyth & Ryan.

Cement Tools
Abram Cement Tool Co.
Wettlaufer Bros.

Coal Chutes
Galt Stove & Furnace Co.

Coal Handling Apparatus
American Hoist & Derrick Co.
Browning Engineering Co.
Brown Hoisting Machinery Co.

Combination Woodworkers
Hutchinson, M.

Concrete Mixers and Appliance ..
Blystone Machinery Co.
Canadian Allis-Chalmers, Limited.
Canadian Concrete Appliance Co.
Chain Belt Company.
Hopkins & Co., F. H.
Koehring Machine Co.
Lecky & Collis.
London Concrete Machinery Co.
Mun. Eng. & Contracting Co.
Mussens Limited.
Waterloo Cement Machinery Co.
Wettlaufer Bros.
Woodstock Wind-Motor Co.

Conduits
Can. H. W. Johns-Manville Co.
Conduits Co., Limited.

Contractors
Eastern Pipe Construction Co.
Foundation Co.
Reggin & Spence.

Contractors' Plant and Supplies
American Hoist & Derrick Co.
Barber Asphalt Paving Co.
Bateman Wilkinson Co.
Beatty & Sons, M.
Browning Engineering Co.
Canadian Allis-Chalmers, Limited.
Canadian Fairbanks-Morse Co.
Canada Lifting Jack Co.
Canadian Concrete Appliance Co.
Douglas Milligan Ltd.
Cleveland & Erie Mach. Co.
Dake Engine Co.
Doty Marine Engine & Boiler Co.
Dore & Fils.
Hamilton Mfg. Co., Wm.
Hepburn & Co., F. H.
Hopkins & Co., F. H.
International Marine Signal Co.
Lecky & Collis.
Marsh & Henthorn.
Montreal Locomotive Works.
Mussens Limited.
Royce Limited.
Schell Foundry & Machine Co.
Stinson-Reeb Builders' Supply Co
Troy Wagon Company.
Woodstock Wind-Motor Co.
Wettlaufer Bros.

Conveying Machinery
Weller Mfg. Company.

Core Drills
Can. Ingersoll-Rand Co., Ltd.

Cork Installation Machinery
Linde British Refrigeration Co.

Corrugated Iron
Can. H. W. Johns-Manville Co.
Metallic Roofing Co.
Ormsby, A. B., Limited.

Cranes, Travelling and Locomotive
American Hoist & Derrick Co.
Browning Engineering Co.
Brown Hoisting Machinery Co.
International Marine Signal Co.
Royce Limited.

Creosote Stains
Cabot, Inc., Samuel.

Crushed Stone and Granite
Ontario Lime Co., Ltd.
Rogers Supply Co.
Sand and Supplies Limited.
Smyth & Ryan.

Crushers (Stone and Rock)
Canadian Allis-Chalmers, Limited.
Hamilton Mfg. Co., Wm.
Hopkins & Co., F. H.
Jenckes Machine Co.
Lecky & Collis
London Concrete Machinery Co.
Mussens Limited.
Wettlaufer Bros.

Derricks and Derrick Fittings
American Hoist & Derrick Co.
Hepburn, John T.

Dredges
Beatty & Sons, M.
Browning Engineering Co.

Drills
Beatty & Sons, M.
Canadian Allis-Chalmers, Limited.
Canadian Buffalo Forge Co.
Canadian Ingersoll-Rand Co.
Lecky & Collis.
Star Expansion Bolt Co.

Drilling Contractors
Harvey, J.

Drill Steel Sharpeners
Canadian Ingersoll-Rand Co.

Dump Cars, Wheels, etc.
Bechtels Limited.
Schell Foundry & Machine Co.
Western Wheeled Scraper Co.

Electric Air Rock Drills
Canadian Ingersoll-Rand Co.

Electrical Machinery and Supplies
Engineering Works of Canada.
Ferranti Electrical Co.

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Boving Company of Canada.
Canadian Buffalo Forge Co.
Inglis Co. John.
Jenckes Machine Co.
Laurie & Lamb.
Leonard & Sons, E.
McDougall Caledonian Iron Wks.
Mussens Limited.
Sturtevant Co. of Can. Ltd., B. F
Waterous Engine Works Co.
Wettlaufer Bros.

Engineers (Civil and Mechanical)
Bowman & Connor.
Campbell, R.
Chipman & Power.
Farmer, John T.
Galt Engineering Co., John
Lea & Ferguson.
Mitchell, C. H.
Thorold Co., F. W.

Expansion Bolts
Star Expansion Bolt Co.

Expanded Metal
Mannesmann Tube Co.

Exhaust Heads
Canadian Buffalo Forge Co.
Sheldons Limited.
Sturtevant Co. of Can. Ltd. B. F.

Field Instruments
Gurley, W. & L. E.

Filler, Floor and Sewer Joint Asphalt
Canadian Mineral Rubber Co.

Filters
American Water Softener Co.

Fire Brick
Improved Equipment Co.
Ontario Lime Co., Ltd.
Smyth & Ryan.

Fire Escapes
McGregor & McIntyre

Fireproof Doors and Windows
Metal Shingle & Siding Co.
Mussens Limited.
Ormsby, A. B.
Steel & Radiation Ltd.

Fuse (Safety Blasting)
Lecky & Collis.

Forges
Canadian Buffalo Forge Co.
Sheldons Limited.
Canadian Sirocco Co.

Furnaces (Special)
Improved Equipment Co.

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Wettlaufer Bros.

Gas Plants Complete
Improved Equipment Co.

Gas Producers for Heating
Improved Equipment Co.

Gas Machinery
Improved Equipment Co.

Glass
Consolidated Glass Co.
Hobbs Mfg. Co.
Luxfer Prism Co.
Toronto Plate Glass Imp't'g. Co

Hammer Drills
Canadian Ingersoll-Rand Co.

Heating Apparatus
Canadian Buffalo Forge Co.
Canadian Sirocco Co.
Sheldons Limited

High Pressure Pipe Lines
Boving Company of Canada.
Escher Wyss & Co.

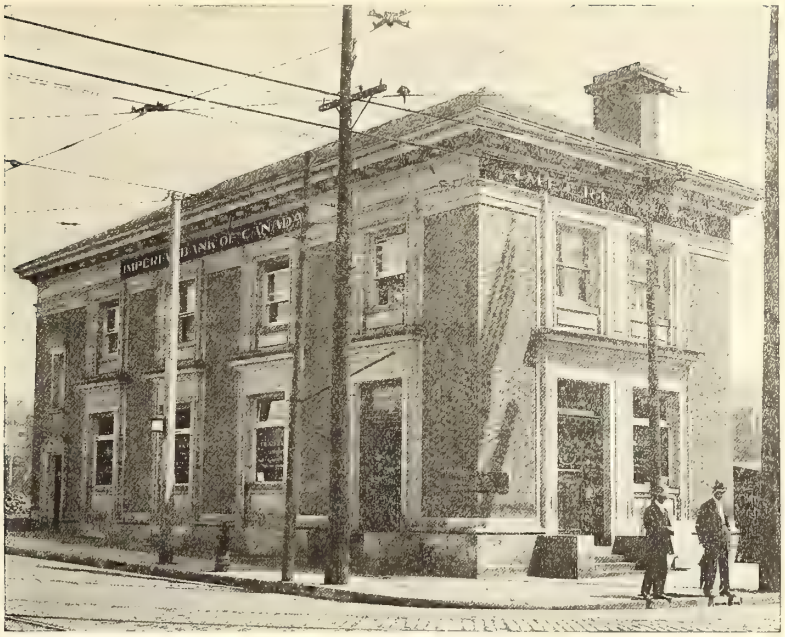
Hoisting Apparatus
American Hoist & Derrick Co.
Beatty & Sons, M.
Browning Engineering Co.
Canadian Allis-Chalmers, Limited.
C. H. & E. Mfg. Co.
Canadian Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co.
Doty Marine Engine & Boiler Co
Jenckes Machine Co.
Hopkins & Co., F. H.
Lecky & Collis.
Marsh & Henthorn.
Mussens Limited.
Royce Limited
Sturtevant Co. of Can. Ltd. B. F

Hoisting Engines
Canadian Allis-Chalmers, Limited.
Canadian Fairbanks-Morse Co.
Wettlaufer Bros.

Hydrants
Canada Iron Corporation.
Gartshore-Thomson Pipe Co.
Kerr Engine Co.

(Continued on page 12)

DON VALLEY



Imperial Bank, Roncesvalles Ave. and Queen St., Toronto.

THE Don Valley Buff Oriental Bricks are particularly well suited for bank and public buildings. They are burned to give a variety of flashes which lend a soft and pleasing effect to any building.

For Toronto's General Hospital over twenty million of these bricks were used.

The decorative possibilities of Don Valley Bricks are without number and that they add distinction and attractiveness to a building is acknowledged.

Specify Don Valley Bricks.

Don Valley Brick Works

Toronto, Ont.

"Steelcrete" Concrete Reinforcement

MAXIMUM EFFICIENCY AT MINIMUM COST

Bridge at Campbellford, Ont. "Steelcrete" Floor Reinforcement

One of the more than two hundred highway bridges throughout Canada with Steelcrete Expanded Metal Reinforcing for the floor slabs.

Slabs of concrete reinforced with "Steelcrete" Expanded Metal make a permanent bridge floor of the greatest strength, at the least cost, and with the least amount of superimposed dead load on the bridge. "Steelcrete" possesses an absolutely mechanical bond against vibration. It lies flat. Once placed, disarrangement is impossible. The meshes are diamond shaped, the joints absolutely rigid. There are no corrugated or twisted strands. When the load is applied there is no straightening out to split the concrete before the reinforcement comes into tension.

Specify "Steelcrete" for
Floors, Roofs, Domes,
Tanks, Dams, Piers,
Sidewalks,
Foundations,
Warehouses,
Power Plants

Made in Canada:—Two Factories in Toronto, one in St. Catharines, Ont.

STEEL & RADIATION, LIMITED

TORONTO
Head Office—Fraser Ave.

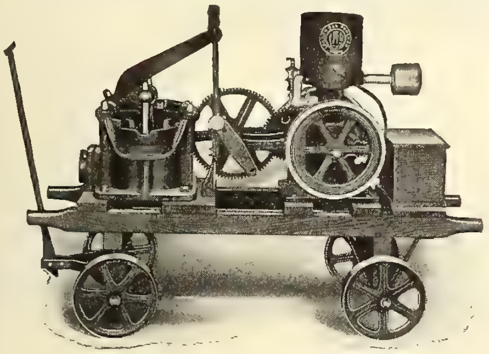
MONTREAL
138 Craig Street West

—AGENTS—

F. S. Coombs, Halifax, N.S.
R. Max McCarty, St. John, N.B.
N. T. Dinnen & Co., Winnipeg, Man.
Canadian Supply & Equipment Co., Ltd., Calgary & Edmonton, Alta.
E. G. Cullen, Vancouver, B.C.

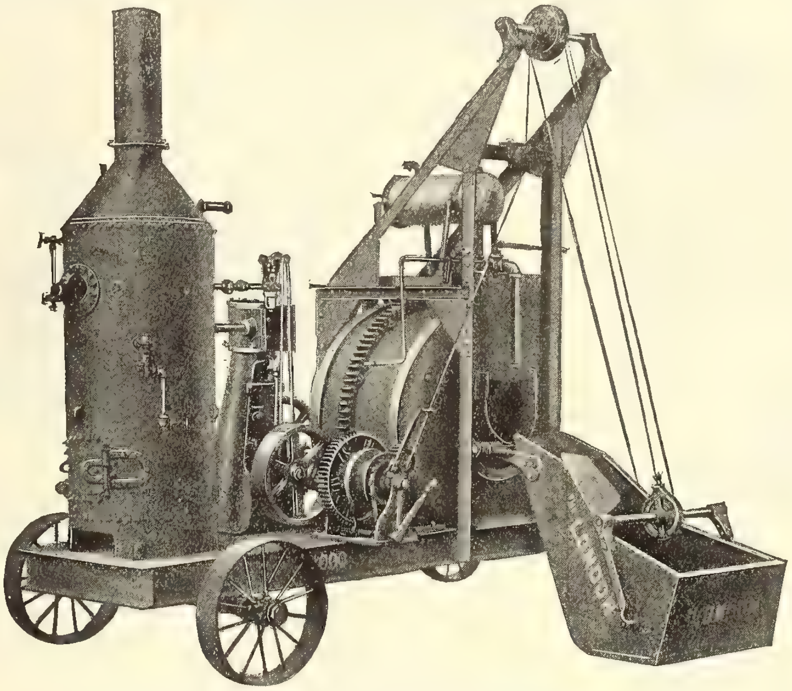
Before You Buy Concrete Machinery

or Equipment of any kind, write us for our 180 page catalogue.



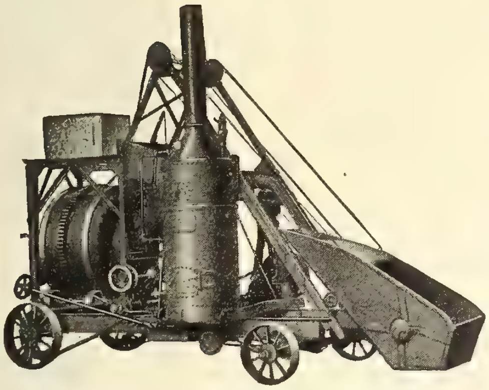
Power Diaphram Pump

We are the largest manufacturers of Concrete Machinery in Canada.



London Standard Drum Batch Mixer

This machine is built in five sizes, fitted with any kind of power; also with traction drive if required.



Rear Discharge Traction Mixer. This machine is also equipped with Boom.

We do not build machinery down to a price but up to a standard.

London Sill Step and Window Cap Mould

A few lines we manufacture—

Concrete Mixers, Mortar Mixers, Tile Moulds, Drain Tile Machines, Side Walk Tile Machines Cement Block Machines, Cement Brick Machines, Sill Step and Window Cap Moulds Gasoline Engines, Screens and Elevators Fence Post Moulds, Hoisting Engines, Material Elevators, Concrete Carts, Wheelbarrows, Scrapers, Sidewalk Forms, Pumping Outfits

A complete line of Contractors' Tools.

London Concrete Machinery Co., Limited

Head Office and Factory: Cabell St. and Kitchener Ave., London, Ont.

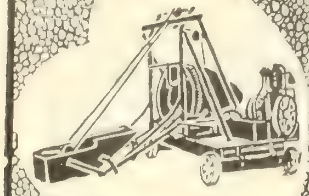
BRANCHES:

WINNIPEG (445 Main St.) W. H. Rosevear, Mgr.
TORONTO (60 Richmond St. W.) F. D. Emsley, Mgr.
CALGARY (622 9th Ave. W.) P. D. McLaren, Mgr.

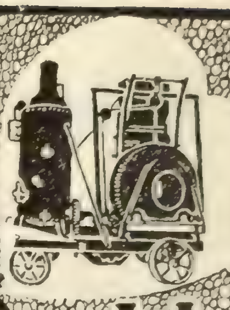
AGENCIES:

VANCOUVER, B. C. Equipment Co. MOOSE JAW, SASK., Bridge & Iron Co., Ltd. REGINA, H. A. Knight
FORT WILLIAM, Northern Eng. & Supply Co. MONTREAL, Foss & Hill Mach. Co.

The Largest Manufacturers of Concrete Machinery in Canada

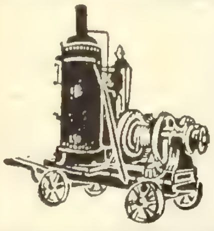


Wettlaufer Bro's IMPROVED CONCRETE & ROAD MACHINERY



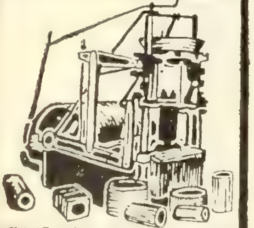
MIXERS

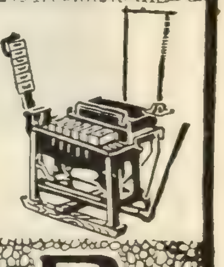
HOISTS



TILE MACHINES

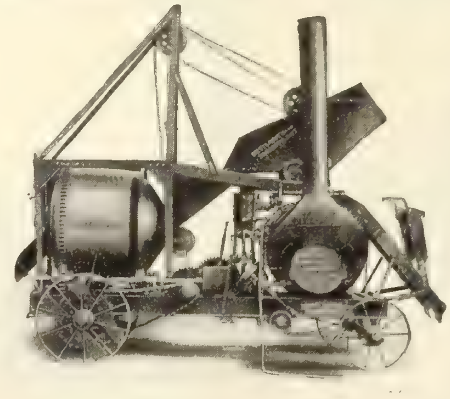
BRICK MACHINES





CRUSHERS

PUMPS



Unique Features

of the Wettlaufer Improved Stationary Heart Shape Drum Traction Mixer.

¶ Extreme width only 7 feet making it suitable for work on car tracks and narrow streets.

¶ Horizontal boiler means a saving of fuel—flues are all completely covered by water thereby lengthening their life.

¶ It is practically impossible to upset this mixer as the load is carried low and evenly distributed.

¶ Only two reduction of gears are used in construction of traction.

¶ Loading skip comes flat down to the ground making easy loading.

¶ Skip is practically the same width at both ends with a flat bottom and always empties clean.

¶ Daily demonstrations at all our branches—you are welcome.

Wettlaufer Brothers

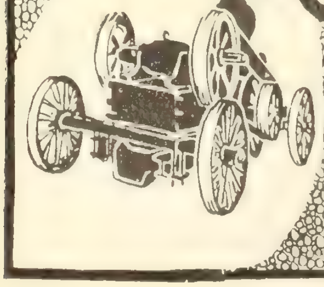
178 Spadina Ave., Toronto, Ont.

Factories: Mitchell, Ont., Buffalo, N.Y., Detroit, Mich.

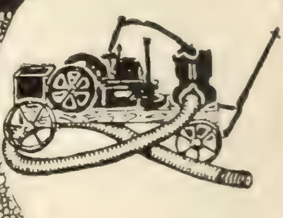
AGENCIES:

A. E. Hodgert, Regina, Sask. Maysmith & Lowe, 1057 Mears St., Victoria, B.C. A.R Williams Machinery Co., 15 Dock St., St. John, N.B. The Canadian British Engineering Co., Ltd., 324 Smith St., Winnipeg, Man. R.F. Mancill, 405 Cadogan Blk., Cal. The Hallman Machinery Co., 374 Alexander St., Vancouver, B.C. J.L. Lachampe, 363 St. Paul St., Quebec.

Montreal Office and Warerooms: 316 Lagauchetiere St. W.



THE FAMOUS WETTLAUFER HEARTSHAPE MIXERS



Crushed Stone

If you want crushed stone in a big hurry come to us and you will get it.

Our bins are always loaded to the top with stone of all grades and shipments can be made the day your order is received.

Quarries located at Dundas and Vinemount.

Portland Cement

Our several cement mills are located at various points that enable us to make prompt shipments with short hauls.

Send us your next order.

Alfred Rogers
Limited
28 King St. West, Toronto

CLASSIFIED INDEX TO ADVERTISEMENTS—CONTINUED

Ice-making Machinery
Linde British Refrigeration Co.

Insulating Compounds
Canadian Mineral Rubber Co.
Standard Underground Cable Co. of Canada, Limited.

Interior Finish and Doors
Batts Limited
Canada Office & School Fur. Co.
Rhodes Curry & Co.

Kilns
Canadian Buffalo Forge Co.
Sheldons Limited.
Sturtevant Co. of Can. Ltd., B. F.
Canadian Sirocco Co.
Berg Machinery Mfg. Co.

Lime
Jamieson Lime Co.
Ontario Lime Co., Ltd.

Lime Kilns
Improved Equipment Co.

Locomotives
Buffalo Pitts Co.
Boving Company of Canada.
Canadian Allis-Chalmers, Limited.
Montreal Locomotive Works
F. H. Hopkins Co.
Mussens Limited.

Marble
Dominion Marble Co.
Missisquoi-Lautz Corporation

Metal Lath
Greening Wire Co., B.
Metallic Roofing Co.
Noble, C. W.
Steel & Radiation Ltd.

Meters, Electrical
Ferranti Electrical Mfg. Co.
Can. General Eectric Co.

Meters, Water
Hopkins & Co., F. H.
McDougal Caledonian Iron Wks
Neptune Meter Co.

Metal Forms
Hotchkiss Lock Metal Form Co

Paints (Bridge and Structural Iron and Pipe Coating)
Canadian Mineral Rubber Co.
Dominion Paint Works.
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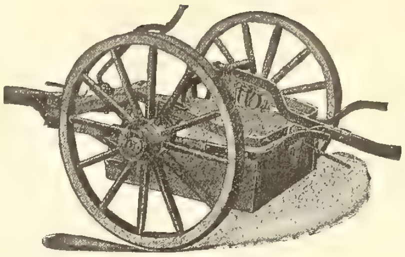

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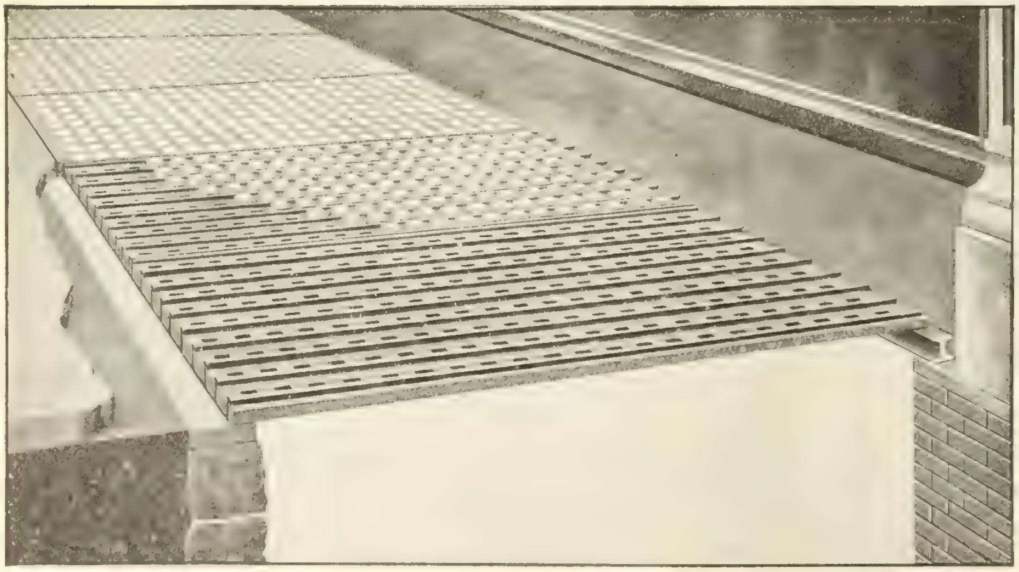

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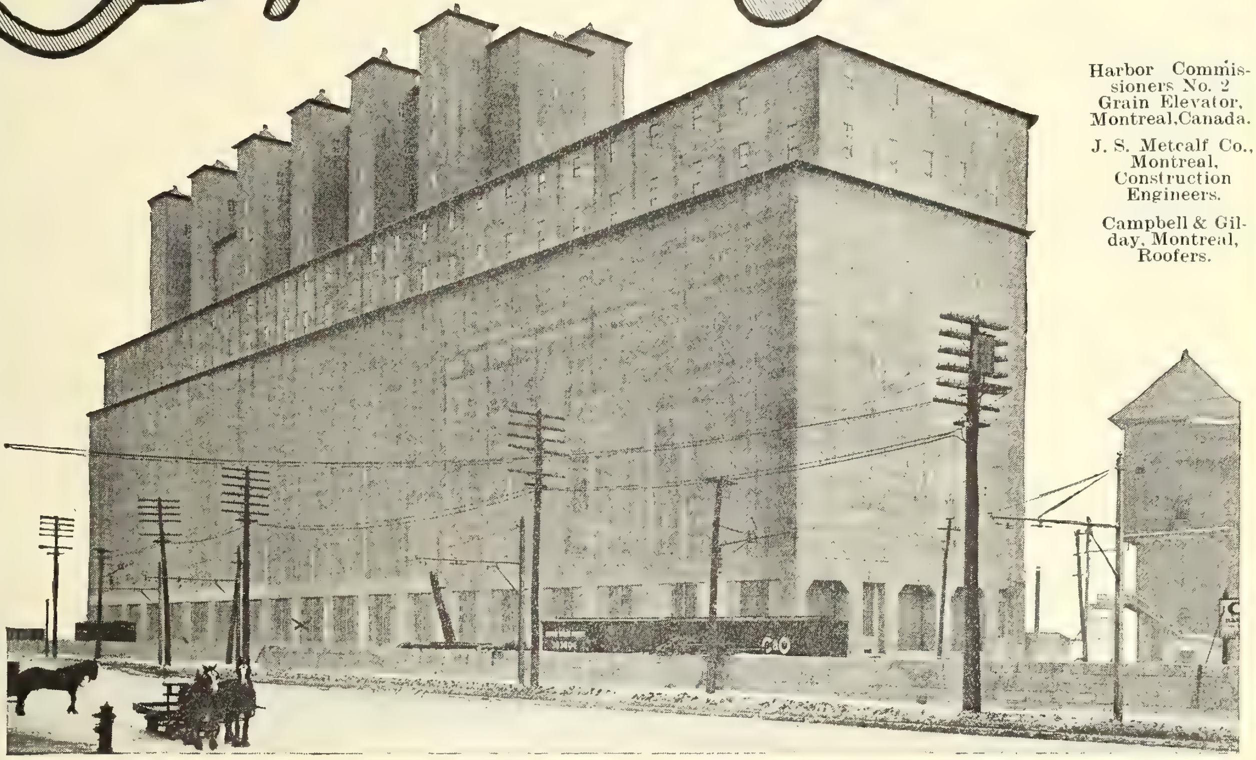

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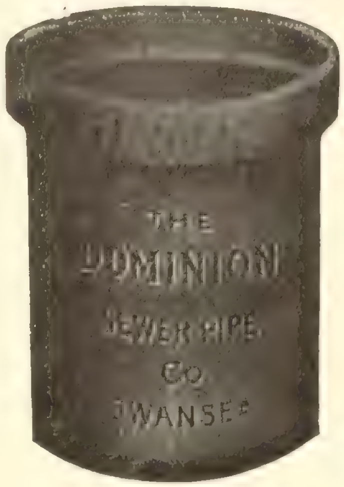

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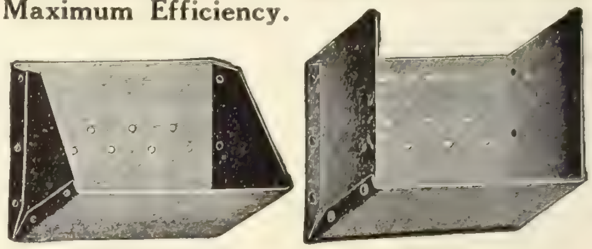

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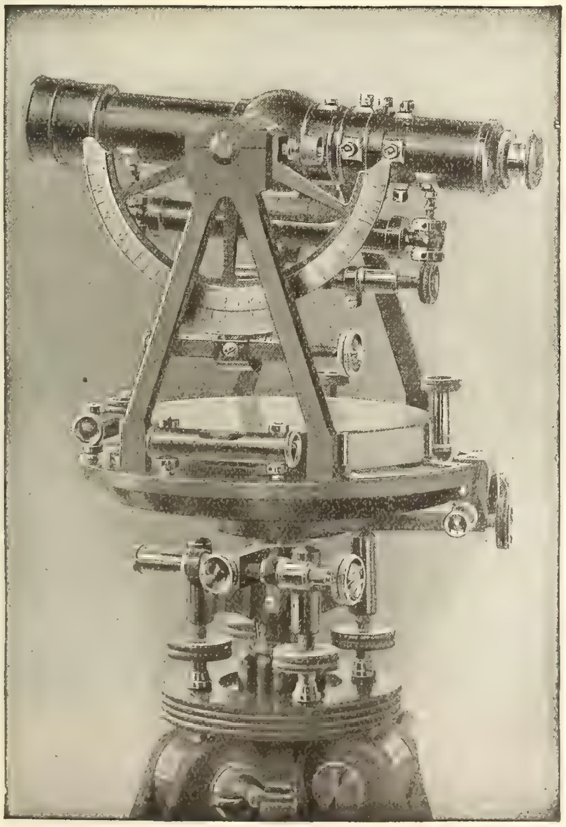

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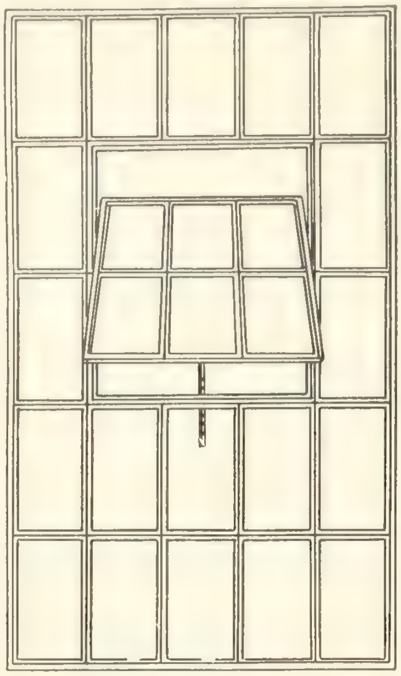

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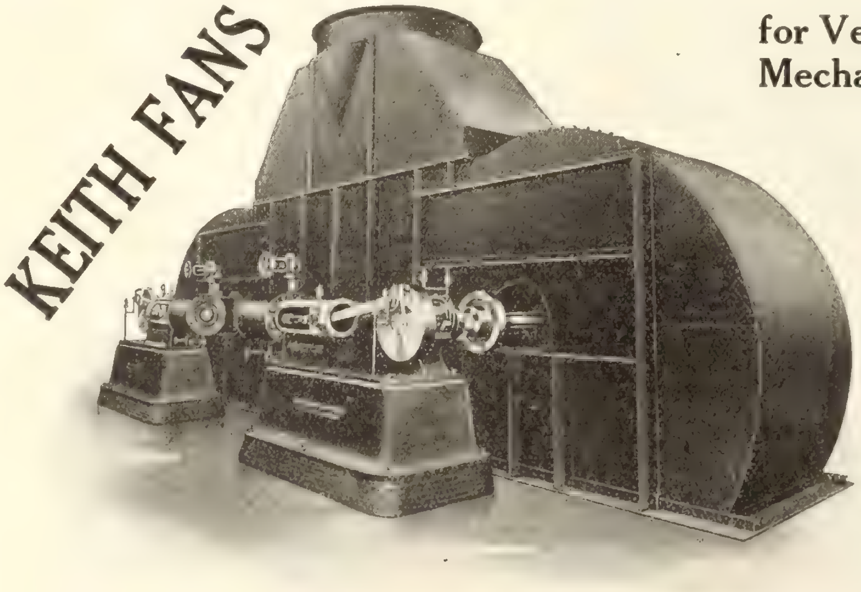

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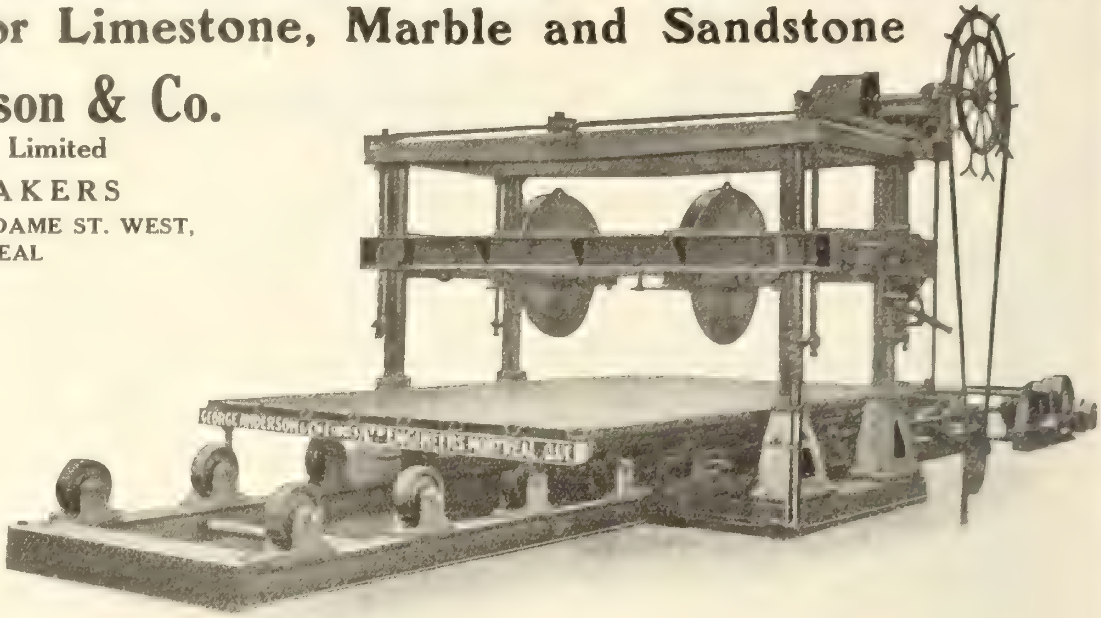

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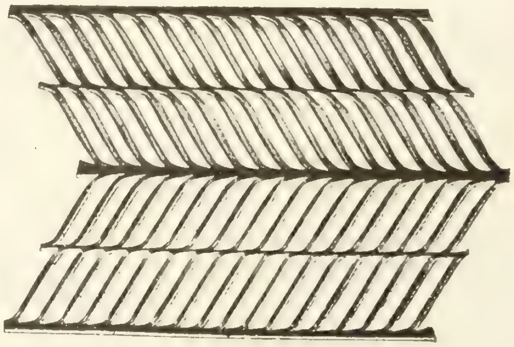

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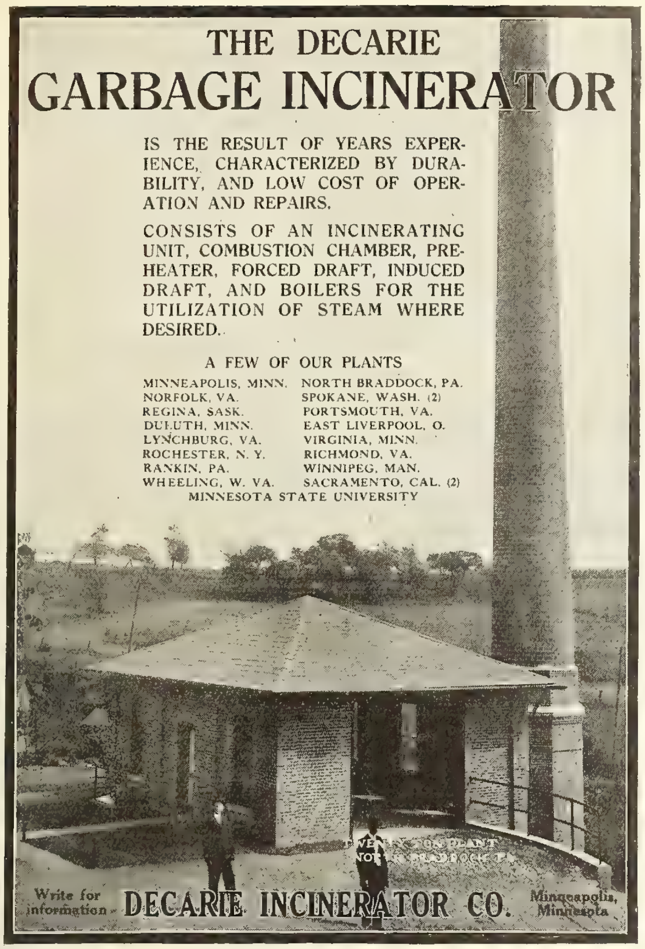

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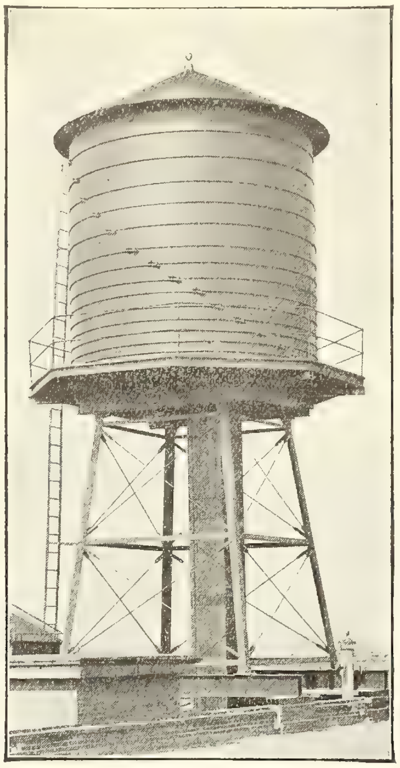

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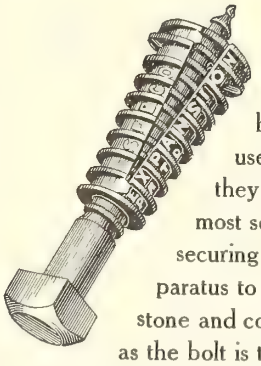

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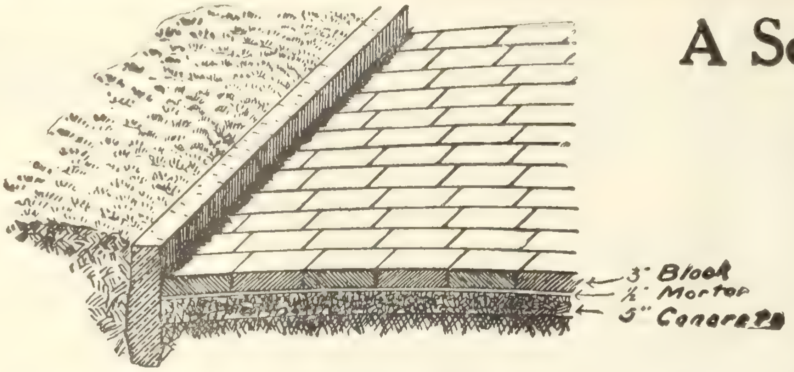

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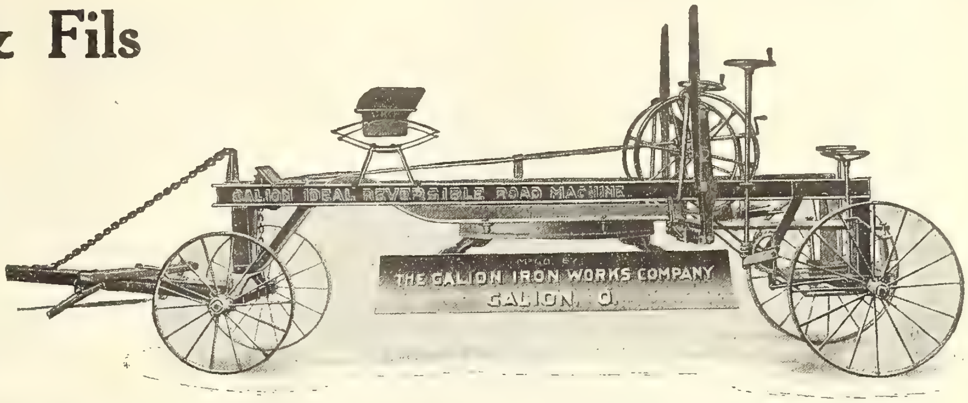
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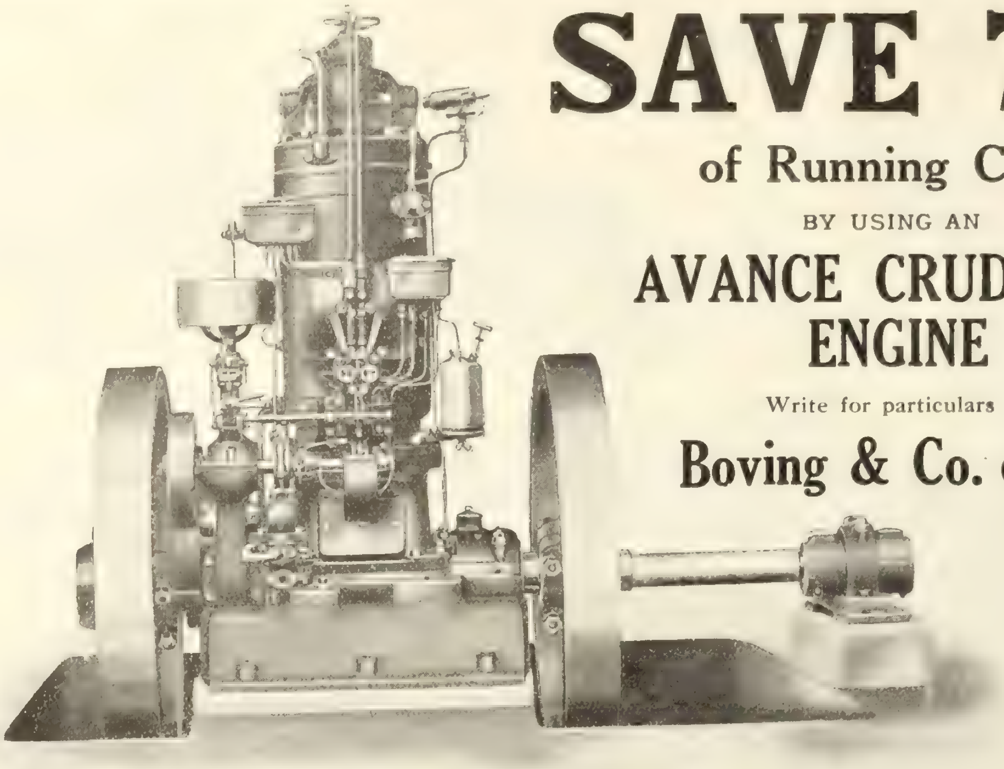

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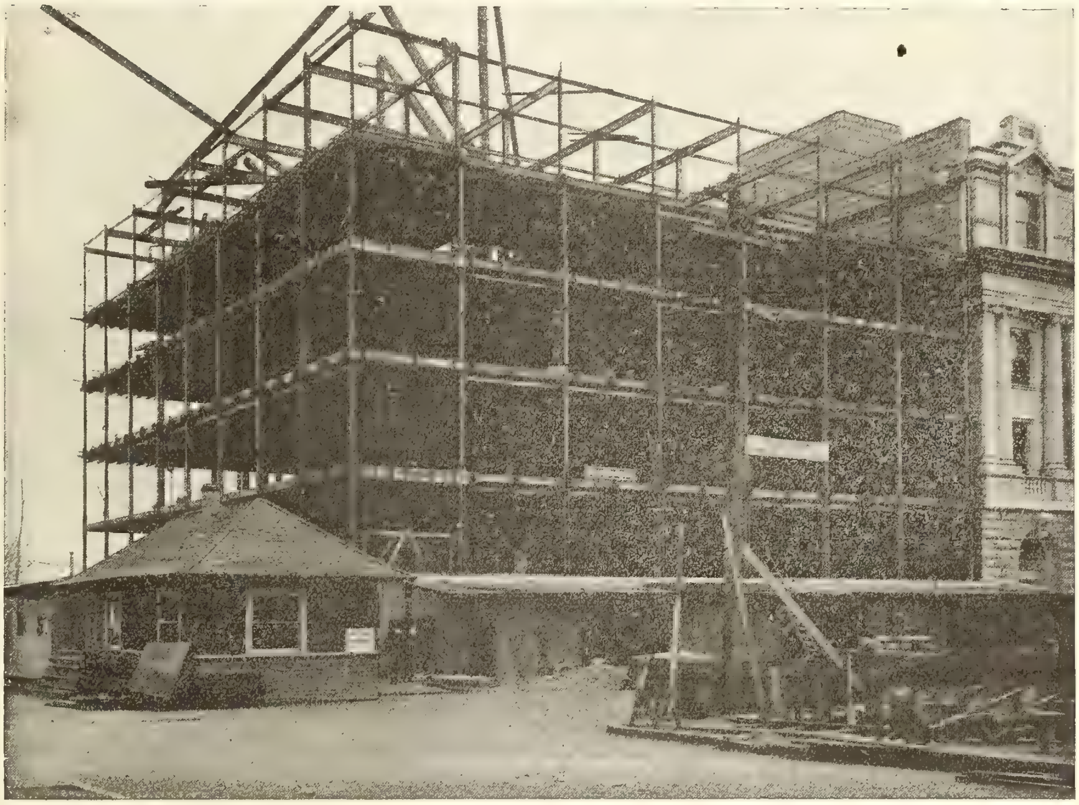

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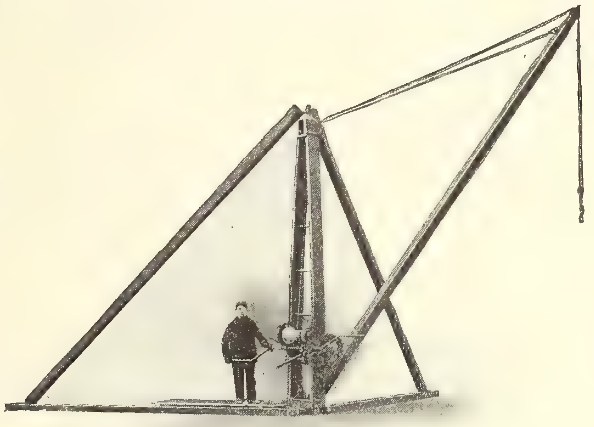

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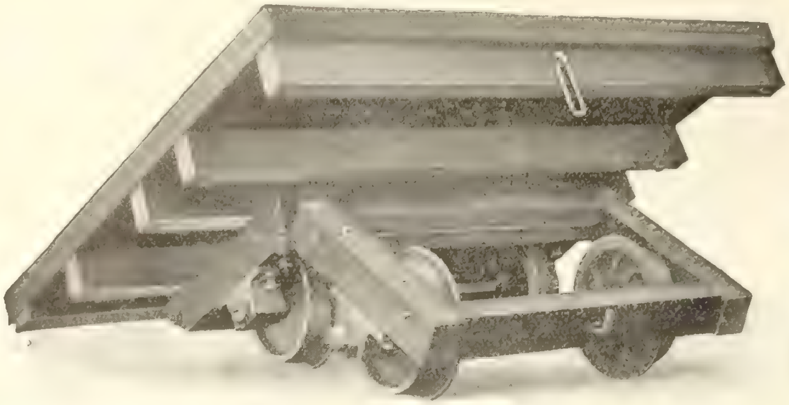

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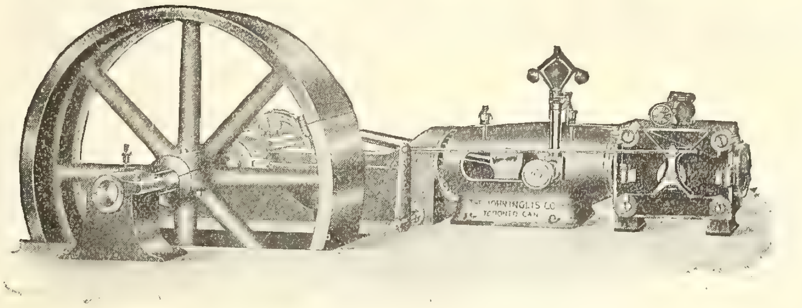

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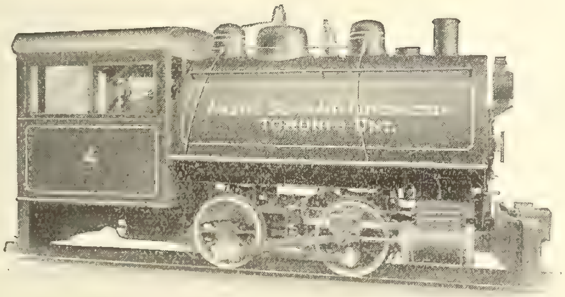

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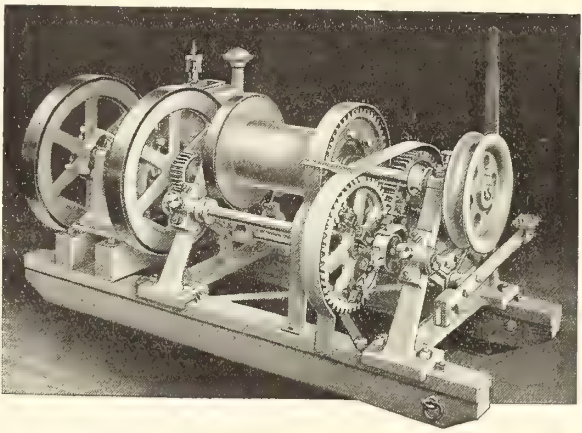

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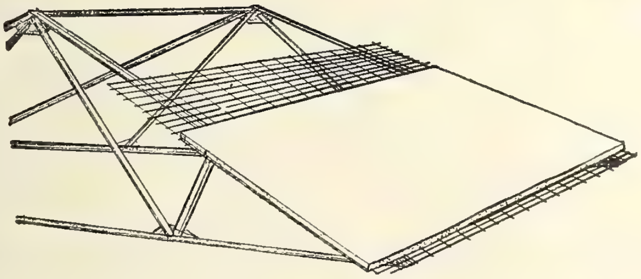

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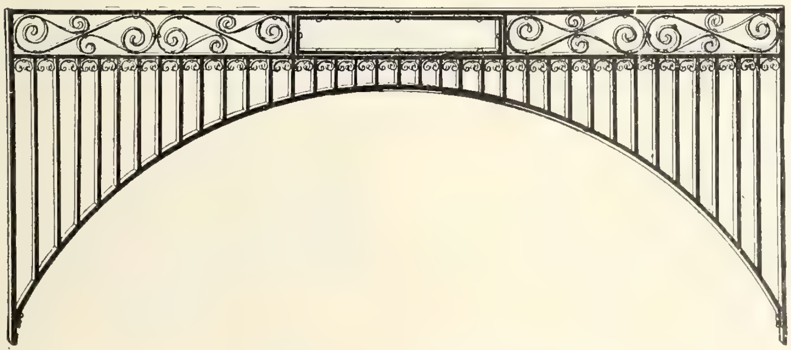

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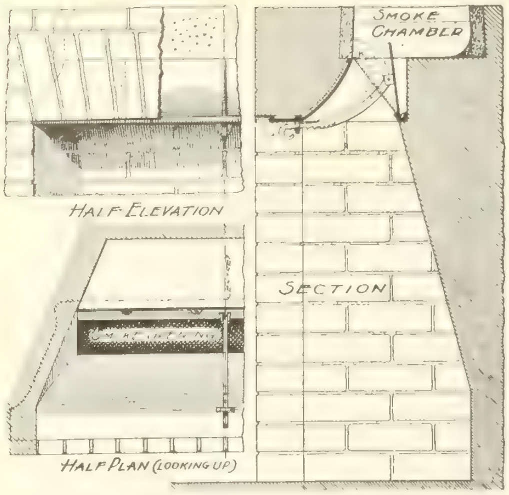

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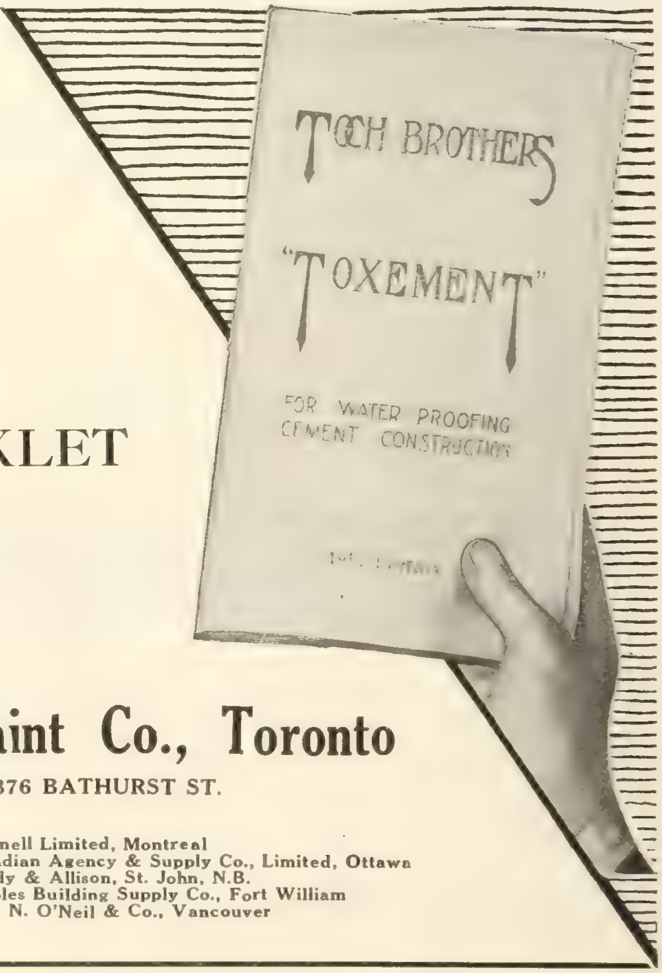

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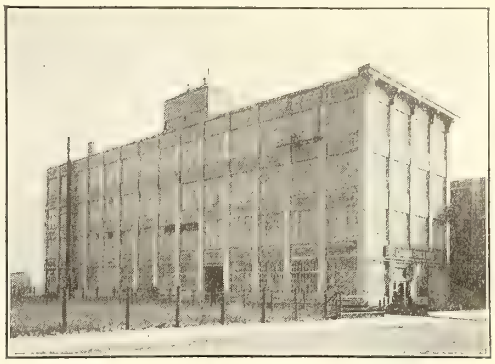

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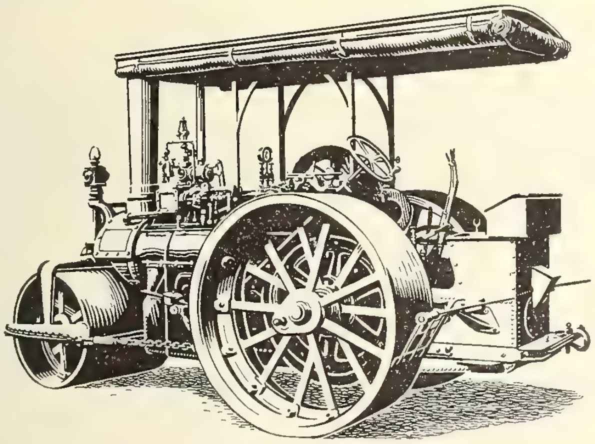

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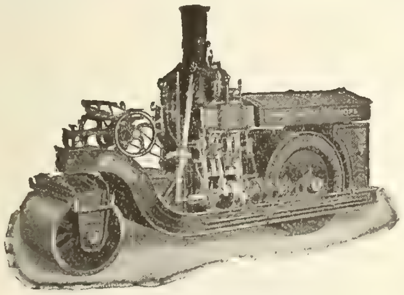

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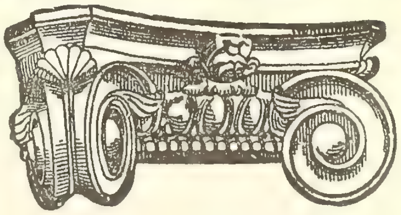

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Lessens Depreciation

The sum which must annually be spent on upkeep and written off for depreciation of buildings can be greatly reduced by the use of Asbestos Corrugated Sheathing.

A mill, elevator, freight shed, factory or warehouse roofed and sheathed with this material presents a practically everlasting exterior, proof against fire and the elements.

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Asbestos Corrugated Sheathing is made in standard lengths of 4, 5, 6, 7, 8, 9, and 10 feet by 27½ inches wide with corrugations of 2½ inch pitch.

Write for our Booklet 9, which shows in detail the methods we have perfected of attaching sheets to wood and steel framing, and of covering ridges and corners.

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Manufactured in accordance with specifications of the National Board of Fire Underwriters.

All our new code wire is inspected by the Underwriters Laboratories Inc. and have their inspection tags attached.

Stock carried at Toronto, Montreal, Winnipeg and Vancouver.

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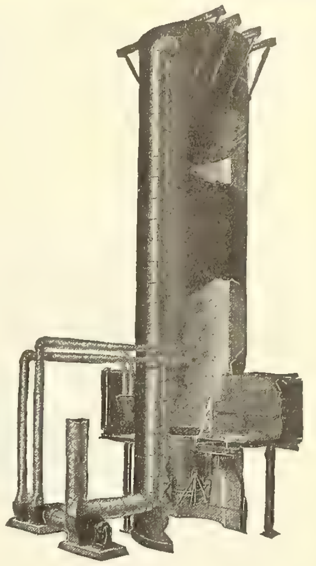
Doherty Lime Kilns make lime of a uniformly high quality. They make it in the largest quantity per unit of fuel and labor cost.

Here you have the key to lime-making profit—high quality and large output combined with low cost.

Bulletin No. 4 is Instructive.



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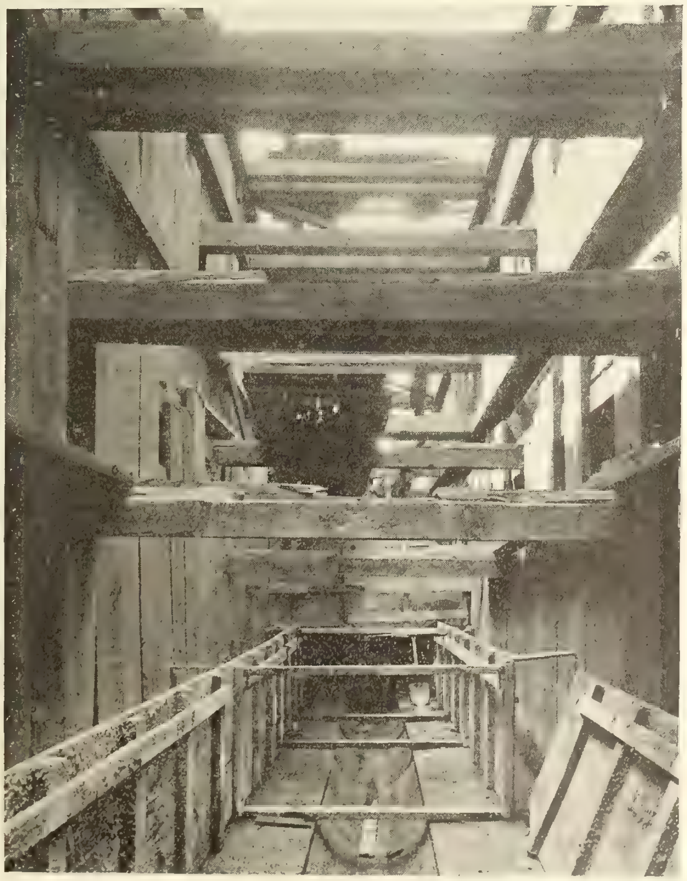

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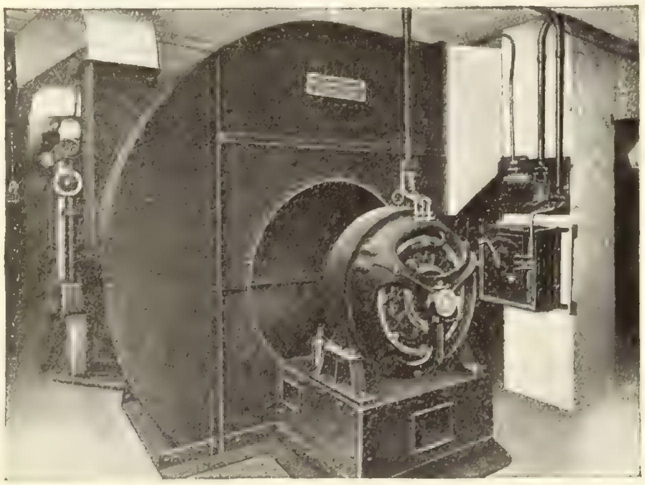

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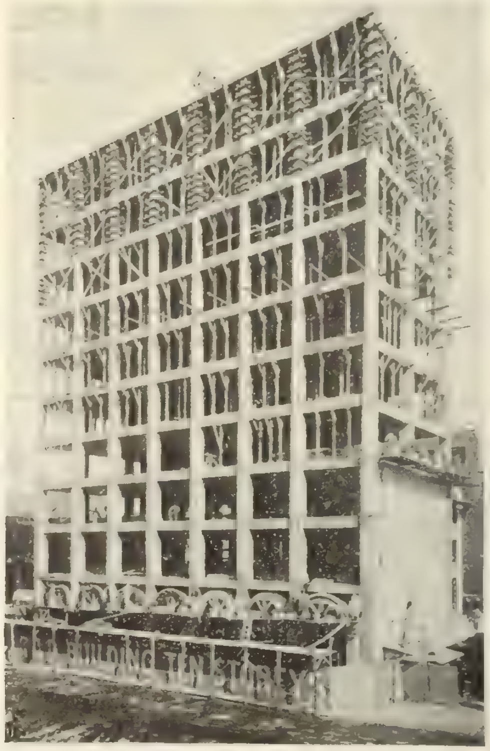
Air-Cleaning System



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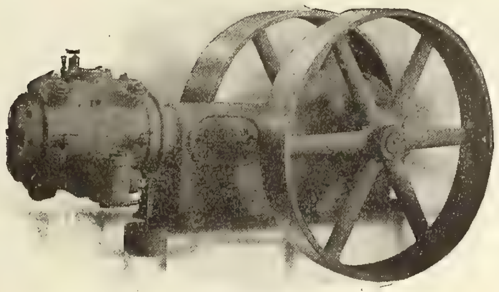
Is just as important from every standpoint as your power supply.

Efficient application of compressed air is only procured through the use of efficient means of compression—a high grade compressor.



Class "NE-1" Single Stage, Belt Driven Compressor described Catalogue K-92.

Your contracts demand the most efficient application of compressed air.

Is it not reasonable to assume that

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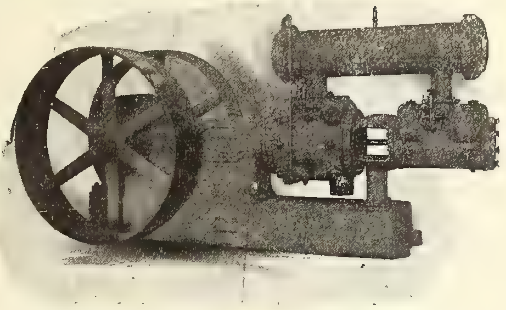
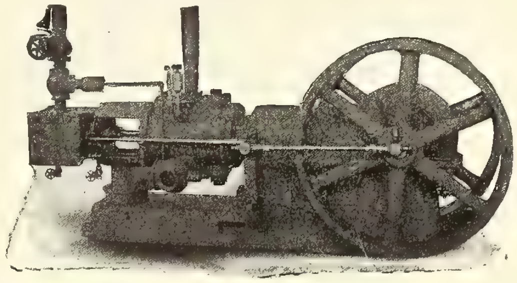


Class "NE-2" Two Stage, Belt Driven Compressor. Details in Catalogue K-99.

The machines illustrated on this page are types of our Class "N" compressors.

While these compressors are compact in their construction they have a greater capacity per foot of floor space than any corresponding type on the market.

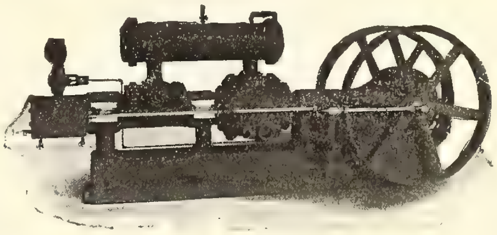


Class "NF-1" Single Stage, Steam Driven Compressor. For description see Catalogue K-96.

Every detail about these machines is the result of a predetermined standard of quality that is high capacity in restricted space.

Both single and two stage machines for either steam or belt drive, with capacities ranging from 57 to 426 cubic feet of free air per minute at pressure from 15 to 100 pounds are included in this class.

Write for Catalogues mentioned.



Class "NF-2" Two Stage, Steam Driven Compressor. Coverd by Catalogue K-98

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LIMITED.

COMMERCIAL UNION BUILDING, -:- MONTREAL, CANADA.

Works: Sherbrooke, Que.

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You can get the material on the job when you want it and *where* you want it.

You don't have to depend upon teams, men or weather, and you will be surprised at the low cost.

Backing Train Along Road—One Man Handles It

BUFFALO PITTS CO. TRACTION TRAINS

Two-Speed Road Locomotives

Patent Reversible Cars

By simply throwing the reversing lever on the connecting hitch the train can be **reversed** to move either forward or back around the sharpest curves as well as in a straight line. Absolutely the only device where this is possible.

Makes the car efficient in places where others are useless. So strong the train will not pull in two. So simple a boy can operate. The greatest time saver of the age.

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MAKERS OF NORTH AMERICA

For over twenty years we have been making this remarkable unfading natural
RED BRICK
Distinctive in its rich, clear, fresh color

"Bradford Reds"

Manufactured in Roman and Standard sizes, are unequalled for uniformity and shade
A pressed brick and each one is inspected before being shipped.

Thousands of buildings and residences are our testimonials

"Bradford Ruffs"

Manufactured with rough textured face offer an unsurpassed rustic effect, specially desirable for residences walls, fences and such ornamental construction.

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WHAT MAKES *WEAR* IN A HOSE?

HARD, satisfactory service—or wear—can only be got from hose that is *properly* made from carefully selected materials.

Goodyear hose-making machines are thoroughly modern. No process has yet been evolved that could build better service into hose.

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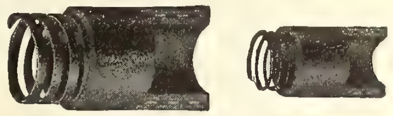

GOODYEAR SUCTION HOSE

Goodyear Suction Hose is made in many styles and in smooth or rough bore. When we understand for what purpose the hose is to be used, we supply the kind that will give the best and longest service.

The smooth bore hose is reinforced by a galvanized iron coil entirely imbedded in the wall of the hose. Water or other liquids cannot reach it. The inner wall is smooth. This lessens the friction resistance to the flow and saves power.

For oils, acids, salt water, etc., that would ruin ordinary hose, we make a smooth bore hose with special oil and acid resisting lining. Special smooth bore hose is made for dredging, wrecking, etc.

For Contractors, Mills and Factories—anywhere where water or non-injurious liquids have to be pumped—we would in most cases recommend our rough bore Suction Hose—strong non-collapsible hose built around galvanized steel coils.

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With fair usage Goodyear Air Hose will be found proof against internal decay from oil—breaking away of pieces of the tube—and clogging of the machinery. The lining is made from selected rubber and cured to prevent hardening from the heat and pressure

Goodyear Air Hose will give good service under intermittent pressure.

In mines, engine and boiler works, steel construction contracts—wherever pneumatic tools are being operated you will find Goodyear Air Hose. Wire or marline winding or marline jacket.

GOODYEAR RUBBER HOSE

The opinion of men who have made a study of every condition that can ruin hose, and have found the remedy, is yours for the asking. When you order, tell us how you are going to use the hose. We can make suggestions that will save you money.

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THE GOODYEAR TIRE

"Underwriters" MILL HOSE

We make a special fire-hose for factory use that is built to meet the specifications of the Associated Factory Mutual Fire Insurance Companies.

This is the GOODYEAR "UNDERWRITERS" FIRE HOSE

Each 50 foot length is tested to 200 pounds pressure and branded to that effect. The inner tube is of the highest grade NEW rubber, of uniform thickness and quality. It will give long service without hardening or cracking. The fabric is made rot and mildew proof by antiseptic treatment.

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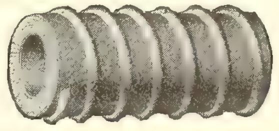

GOODYEAR STEAM HOSE

This hose is highly esteemed by practical men. Goodyear Steam Hose is made for extra hard service. It is lined with a special heat and oil resisting seamless tube

Goodyear Steam Hose is a reliable hose under high pressures of steam or hot water. Don't take chances by using inferior hose for steam. Have Goodyear—it is made for high pressure from carefully tested materials. The inner lining is of a special rubber composition which resists the action of heat. It keeps the extreme heat from the frictioned fabric. This is what makes Goodyear Steam Hose durable.

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THE GOODYEAR TIRE & RUBBER COMPANY of CANADA, LIMITED
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30,000 lbs. "MEDUSA" Waterproofing used in this building

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"MEDUSA" WATERPROOFING

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Beware of Imitations

The very success of "Medusa" Waterproofing has led to the rise of a host of imitations and infringements. These so-called waterproof compounds are of such poor quality that it is necessary to use a proportion four times as large as "Medusa" Waterproofing and then these imitations only produce an **apparent** and **temporary** effect.

The effect of "Medusa" Waterproofing is everlasting and its permanent quality is due to its being absolutely insoluble and unaffected by water even after years of contact.

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ESTABLISHED 1886

Contract Record and Engineering Review

PUBLISHED EACH WEDNESDAY BY

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Alphabetical Index of Advertisers Page 16

Vol. 27 **July 2, 1913** **No. 27**

Present Conditions and the Outlook

IT is only history repeating itself that a period of financial depression should follow one of marked activity. The present moderate depression, however, should not cause widespread unrest throughout the commercial and industrial community. Underlying conditions are absolutely sound and Canada's proverbial resiliency will doubtless be reflected in the early return of confidence to business circles.

In order to understand the state of trade and commerce in the Dominion it may be well to glance at the monetary conditions of some of the leading nations. The financial and commercial organization of the world is of so delicate an adjustment, that a disturbance in any one part is naturally felt in others to some extent. Some of the European financiers trace the beginning of the stringency back to the Morocco incident, when Germany was forced to recede from her position through the withdrawal of loans by other nations. To prevent a recurrence of such an unpleasant situation the German Empire has since been hoarding gold. The Balkan war, however, is generally held responsible for the present crisis. War inevitably produces commercial depression. It often ends in the bankruptcy of one or all of the nations engaged. It is impossible to withdraw money from the ordinary commercial enterprises and use it for the accumulation of vast war stores and in the equipment of enormous forces; it is impossible to withdraw thousands of men from peaceful pursuits and support them as non-producers, without disturbing the world's trade. So, with the great continental powers hoarding their gold and mobilizing their armies, and private lenders in alarm withdrawing their loans, very little money has been available to finance regular business enterprise. The European outlook has vastly improved, but confidence will not be completely restored until the diplomats now in London arranging the financial basis of the Balkan peace, have completed their task.

Germany, as a result of her attempts to keep in a state of naval, military and financial preparedness, is running her business on bank credits and, as the banks curtailed their credits during the period of hostilities, the manufacturing output has been greatly lessened and trade seriously embarrassed. In England the stringency was augmented by labor unrest and costly and destructive strikes. The United States, in sympathy with the world markets, felt the money scarcity severely; this lack of ready capital was further accentuated by local conditions. Uncertainty arising from proposed tariff changes, the "anti-capital" attitude of the government as it is termed by one coterie of critics, the projected reorganization of the banking system, the refusal of the Interstate Commerce Commission to advance freights, and the conduct of the money trust—these, operating conjointly, have caused a depreciation in the value of the best American securities, reaching, it is estimated, the enormous sum of $3,000,000,000. However, uncertainty is now apparently giving place to confidence and financial conditions are greatly bettered.

In Canada the money tightness has been intensified by peculiarly national causes. Undoubtedly there has been excessive land speculation and municipal expansion, and this very expansion is in itself a cause of money scarcity. The Northwest farmer has not been receiving adequate returns. What with lack of storage facilities, high transportation rates, and the necessity for immediate sale, at low prices, to meet pressing liabilities, the profits have been, on the whole, small. Add to this the difficulty of procuring loans even at a high rate of interest, and it can be readily understood why there is no expansion of the wheat acreage this year. Eastern Canada markets much of her output in the Northwest provinces and is manifesting an attitude of uncertainty as to the probable outcome of the stringency.

Have Canada's resources been diminished or depleted? Not in the least. The same wheat areas are there deep and fertile, herds of cattle range the prairies and untold wealth lies buried in the hills. We yet have great measures of coal and iron and vast uncut forest. The cities of Canada have still the great additions they have made to their wealth in the form of civic undertakings and conveniences. The large manufacturing concerns with their buildings and equipment and trade organization and facilities have still that which industry and intelligence have gathered. Inexhaustible power in the rivers and streams of this country lies at our door. Land speculation is not the source of a nation's wealth; the excessive investment in land has helped to make money tight. This flurry will only cause land prices to be placed more nearly on their actual values. Municipal development may be restricted, but that need last only until this year's crop is marketed.

There is no cause for alarm, only need of confidence and sanity. Everything points to improved conditions for the western producer. Better storage is in sight. The terms of the new bank act ought to prove beneficial. The creation of the American Federal Reserve Banks should have a tendency to obviate the necessity for large loans from the banks of this country, and cause Canadian capital to be used in Canadian development. The crop reports are most favourable and with the lessened output in Europe as a result of the war and the two million and over of men added to the standing armies of that continent, and thus requiring support while not producing there should be a ready market for every bushel grown.

In the east manufacturers report an abundance of orders. Some feel that because of the great strain placed upon their institutions they have not been able to cope with the business rules to their entire satisfaction and would welcome a period of conservatism. For the Canadian manufacturing, contracting and building circles there is this cheering feature: the great public works at present under construction and contemplated by the Dominion Government and the various Provincial Governments, the vast enterprises now being pushed to completion by the four railway corporations of this country, will call for large supplies of material and will furnish abundance of work for some time to come. These undertakings are estimated to be at least two hundred millions of dollars and this is assured capital and should go a long way to prevent any serious falling off in production until money is more readily obtainable.

What is needed is cheaper money for the farmer in Western Canada and reasonable patience before the withdrawal of support from the smaller manufacturer. What is needed above all is an exercise of that confidence expressed by Sir Edmund Walker, when he said in regard to the present situation, "There is bound to be considerable stringency in the autumn and it won't be so easy to finance the crop-moving operations this year as during the past few years. But I do not anticipate anything serious."

These are the times that test the strength of men. These are the days demanding calm thought and deliberate judgment and a broad, statesmanlike grasp of the commercial situation. Carefulness in word and deed and absolute refusal to be stampeded by mere alarmist reports, may not only save the situation, but also serve to put our commerce on the firm basis that provides regular and conservative expansion.

Editorial Notes

THE announcement is made that the output of the waterworks plant at the Island, Toronto, will be increased from 40,000,000 gallons per day to 100,000,000 per day. The work will be undertaken probably next spring. If the experiment at west Toronto combining mechanical and slow sand filtration is a success, the process will likely be adopted in the equipment of the extension.

* * *

HOW trade is welding together the nations of the world is seen in the difficulties of some building trades in the American Republic. Since the Balkan war not a shipment of Grecian marble has been received. The Greeks have been too busy to bother with their quarries. Consequently a number of large contracts are being held up because the builders cannot get the grade of marble required for inside finishing and decoration.

* * *

THE attention of the readers of the Contract Record is called to several letters published in this issue bearing on the question of deposits with tenders. The letters are from prominent contracting firms and show the interest that the discussion has aroused. Several of the firms seem to recognize that there is a real difficulty involved in the question and that the required deposit may be a serious matter for some contractors. Solutions for the difficulty are suggested and no doubt some benefit will result from the discussion.

* * *

WINNIPEG is looking for a new water supply. The water now used has a temporary hardness of 150 to 170 parts per million and double that of permanent hardness. A board of engineers appointed in 1907 recommended a filtered supply from the Winnipeg River, but no action was taken. A new board consisting of Mr. R. Hering and Mr. J. S. Fuertes, of New York, and Mr. E. P. Stearns, of Boston, will report on the possibility of getting a supply of softer water from Lake Shoal which is really the western part of the Lake of the Woods.

* * *

EGYPT stands as the permanent expression of what engineering skill can accomplish. Prior to the advent of the British engineers the country was wholly dependent upon the uncertain rise and fall of the Nile. The areas under cultivation depended entirely upon the extent to which the river overflowed its banks. The building and enlarging of the great Assouan dam and the establishment of a system of irrigation has given an assurance of regular harvest and made possible a constantly increasing area of cultivation. At the present there are over one and a half million acres of cotton producing land. But this is not all. A second dam is to store the waters of dangerously high floods. Further, some manufacturing is contemplated, the reservoir supplying the necessary power. As one would expect, Lord Kitchener in his very able report announces the formation of a Main Roads Department to study and develop the highways. So much for British rule and the British engineer.

New C. P. R. Double Track Tunnel

The activity of the C. P. R. is seen once more in the announcement of Mr. J. G. Sullivan, Chief Engineer of the Western Division, that the Selkirk mountains are to be pierced by a tunnel 5 miles in length. This is one of the largest contracts given in recent years and involves the expenditure of several millions of dollars. The Canadian Pacific engineers look upon the tunnel scheme as a work of the greatest importance and expect that it will effect a very marked saving in the expense of transportation. The tunnel will shorten the line by 4½ miles and will reduce the elevation that the trains are required to be lifted now by 540 feet and will save 2,400 degrees of curvature. As a result of this undertaking there will be but one stretch of 2.20 grade against westbound traffic from coast to coast. The tunnel will enter the Selkirk mountains on the east end in the valley below Bear Creek Station on the present line and will come out at the loop. The contract has been let to Messrs. Foley Bros., Welch & Stewart, of Vancouver.

Philadelphia's Fight Against Water Waste—Splendid results have already been obtained by Director Cooke in his fight to reduce the waste of filtered water in Philadelphia. Instead of being strained to their capacity, the filter plants, due to the lessened demand, are being operated under much more favorable conditions, both as to wear and tear and to coal consumption. In West Philadelphia the consumption rate has been cut from 170 to 125 gals.

Deposits With Tenders—Discussion Continued

Deposit Advantageous to Neither Party

Editor Contract Record,—

In answer to your communication of the 20th inst. I may say that I never could see why a large deposit should be demanded from a contractor along with his tender.

Most advertisements calling for tenders for work reserve the arbitrary right to the party calling for same to reject the lowest or any tender. Reserving such right to deal with the tendering as he sees fit the owner has it in his own power to make all necessary inquiries with regard to the ability and reliability of the tenderers and if any of these appear to him objectionable on any ground whatever, all he has to do is to turn down such tender.

Then so far as the tenderer is concerned it is an undue burden on him to have his capital tied up by the furnishing of a large deposit which may be held for a long period with no results but the loss of the use of this capital. Again, the size of the deposit demanded with the tender on large work sometimes leads to the contractors getting together before tendering, to the detriment of the party calling for the tenders.

Altogether I see no adequate advantage to either party in demanding a large deposit with the tenders to balance the positive disadvantage to the tenderer and possible disadvantage to the other side.

Yours truly,
The Constructing & Paving Co. of Ont., Ltd.

Practice of Bidding Criticised

Editor Contract Record,—

The question you raise has not been of very great interest to me. It seems to me that so long as proprietors can entice contractors to bid (or make bets with them) on how cheap they can do a piece of work, the added inconvenience of furnishing the guarantee is a very small matter. You do not appear to be interested in the great number of people who are experts in letting contracts to the lowest bidder, knowing that he cannot do the work with any possibility of profit. There are some people who take a delight in this kind of game, although if they were asked to make a speculative quotation on the goods they handle, they would think that someone was trying to be smart with them. This kind of people manufacture or stock goods or parts and add some work to them and afterwards add a profit. When this is done the goods are offered for sale not to the "lowest bidder." All the exigencies and contingencies and responsibilities are loaded on him, while the purchaser stands back and laughs at his struggles and takes a lot of labor for which he has not paid.

I suppose this kind of thing must go on until the purchaser is willing to pay the cost of the work plus a certain profit for the services of a responsible contractor whom he can choose before offering the work.

In your issue of June 18th on page 62 is an article evidently inspired by a Surety Company giving the outline of a very dishonest method said to be practised by contractors. In twenty-six years experience I have never had an opportunity of being one of a number in such a case, and I do not think the publication of such a plan is following out the purposes of your paper. I am of the opinion that some of the methods of surety companies for obtaining premiums are quite as reprehensible.

Yours truly,
A Contractor.

Commends the English Sytsem

Editor Contract Record,—

I have before me your letter of the 21st inst. regarding the Canadian system of requiring an excessive deposit with tender. I am very glad to note that you have taken this matter up, and I trust that you may succeed in bringing into effect the English system. You understand that at the present time Contractors are not only required to make, say a 5 per cent. deposit with tenders, but they are also required to pay an inspector, appointed by the authorities to see that their specifications are carried out, and in addition to that the authorities, in most cases, hold back 20 per cent. of the work done, for a period of months after the work has been completed, as a guarantee. This, I consider is very unfair. If the authorities make the specifications and appoint an inspector to see that they are carried out, why should the Contractor put up a cash guarantee?

What I would suggest would be that the authorities ask for a deposit not to exceed the expenses connected with the calling for tenders, and that an estimate be paid the contractors at stated times, to within 10 per cent. of the cost of the work done, and upon completion of the work the contract price should be paid in full.

I believe that if that plan were followed, the cost of construction would be greatly reduced.

Yours very sincerely,
Canadian Contracting and Construction Company.

Favors Guarantee by Bonding Company

Editor Contract Record,—

We believe that the submission of tenders on municipal and government work and on important private operations should be accompanied by a guarantee of ability on the part of the firm tendering, to carry out successfully the intent of their tender, but we are in favor of a bond issued by any responsible bonding company rather than a certified cheque and this in every instance.

Our reason is the low cost of the bond which serves exactly the same purpose as a certified cheque and does not tie up any portion of the working capital of the firm submitting the tender.

If the use of the certified cheque is to be continued, it is our idea that in all justice to the firm submitting the cheque that it should be returned upon the award of a contract and its place taken by a bond covering the successful completion of the work.

We also think in this connection, that the use of individuals or firms other than those in the bonding business for the purpose of guaranteeing the completion of any contract should absolutely be discontinued and prohibited by law for reasons that are obvious.

Yours very truly,
The A. B. Ormsby Company, Limited.

The city of Nanaimo, Vancouver Island, B.C., has been connected with the mainland by means of a telephone cable. The terminals of the line are at Nanaimo and Vancouver. The work covered a field involving the preparation of a 32-mile cable, careful soundings of the Gulf of Georgia and the preparation of the ship and the construction machinery to obtain a careful and uniform dropping of the cable. The task was accomplished without a hitch and it is expected that the convenience resulting will be of the greatest benefit to the business men of the Island of Vancouver.

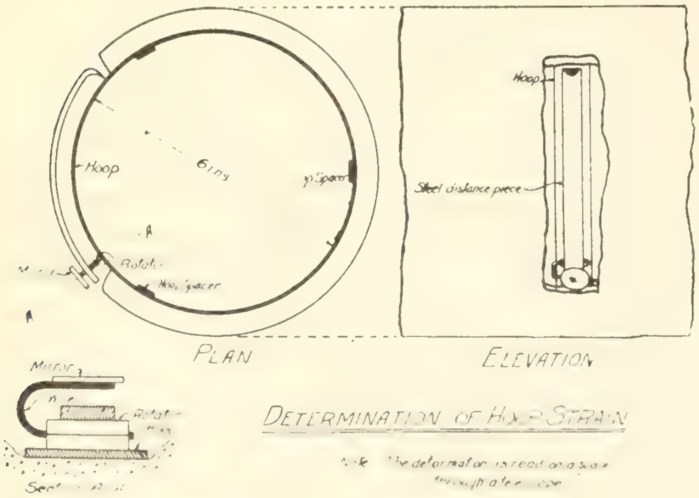
Reinforced Concrete Columns*

Restrictions Too Severe—Ideal Conditions For Strength —Tests on Hooped Concrete Columns — Inferences.

By Peter Gillespie, Associate Professor of Applied Mechanics, University of Toronto.

The growth in the use of reinforced concrete constitutes the greatest epoch in engineering of the present generation. The comparative cheapness of this material, its fireproofness, its adaptability and the general satisfaction which has attended its use where the design has been careful and the work reliable, have given it an increasing popularity. While it occupies a narrow but a growing field in the realm of aesthetics, its applications in constructive art per se are legion. Of it, beams, slabs and columns, and tension members even, have been constructed. These elements have been fabricated into warehouses, factories and dwellings; dams and retaining walls; standpipes, pressure mains and sewers; viaducts and bridges. So rapid indeed has been the progress that none but the experts have been able to keep pace with its advancement.

The concrete column has not, in my opinion, been accorded in building regulations the consideration it deserves. The demands of ultra-conservative building codes have been such that its use has been all but prohibited, because of the excessive size and cost required notwithstanding the fact that actual failures of structures due to collapse of concrete columns have been exceedingly infrequent. It seemed likely, however, after a number of preliminary tests had been made and analyzed, that the rich mixture concrete promised economics not afforded by the leaner grades, and in consequence, the columns to which the following remarks especially apply were a series made of a 1-1 mixture, the ingredients being equal volumes of cement and crushed stone of size three quarter inch and smaller. Some of these were plain, some were reinforced with longitudinal steel and some with welded steel hoops. They were tested at the age of six months.

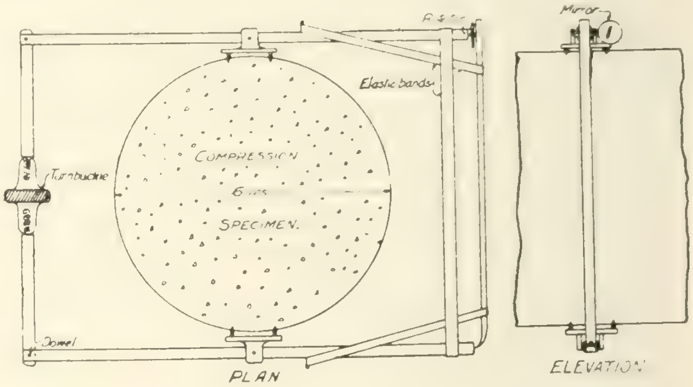


DETERMINATION OF HOOP STRAIN

Note — The deformation is read on a scale through a telescope

Fig. 1

Like all other materials of construction, concrete possesses to a greater or less extent the power of recovering after stressing its original size and shape. In this respect it bears some resemblance to steel, but unlike the latter, its elastic properties are very variable. Its rigidity may vary from one-fourth that of steel to one-fortieth, while its strength in compression may lie between one-twelfth and one-one hundred and twentieth of that of the metal. Ordinary 1-2-4 concrete has a strength in compression of about 2,000 pounds per square inch and a modulus of elasticity of about 2,000,000 pounds per square inch, so that it will be apparent that its strength, relative to steel, is one to thirty, while its rigidity or stiffness compared with the metal is one to fifteen. In consequence, in composite members where the two materials compress together, the stress in the steel will be fifteen times as great as that in the concrete, and the factor of safety of the former will be double of that of the latter. This will indicate one essential difficulty in employing longitudinal steel economically in combination with concrete in columns. Clearly, the ideal condition will occur when the relative strength ratios of the two materials are equal to their stiffness ratios. The extent to which this desideratum has been realized in the rich mixture column will be presently seen. Another circumstance is that at current prices of ordinary concrete and steel, a load in compression can be sustained by the former at about half the cost incurred when the latter is employed.



DETERMINATION OF POISSON'S RATIO

Note — The deformation is read on a scale through a telescope

Fig. 2

The actual crushing strength developed at the age stated above was, in the average, well over 5,000 pounds per square inch as may be seen from the following table. This in my opinion should warrant a working stress in compression of 1,250 pounds per square inch. This will insure as wide a margin of safety as that afforded when the ordinary grade of concrete is stressed to the extent permitted by common specifications.

Crushing Tests on Rich Concrete

Specimen	Crushing Strength
A	4,900 pounds per square inch

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* From the Journal of the Regina Engineering Society.

B	5,975	"	"	"	"
C	5,510	"	"	"	"
D	6,160	"	"	"	"
E	4,120	"	"	"	"
F	5,480	"	"	"	"

Columns of the aforementioned mixture, as stated above, were made and tested and accurate observations as to shortening under load were made. One of the most striking features in all cases was the remarkable manner in which the proportionality of stress to deformation obtained up to, and exceeding in many cases, stresses of 2,000 pounds per square inch. Any one who has studied the records of tests made on columns of the ordinary grade of concrete will recall how, as the stresses increase, the deformations increase also, but at a much greater rate, so that perfect recovery, except for low stresses, is impossible to attain. The following record gives the co-existent stresses in steel and concrete in a few instances of longitudinally reinforced columns of the present series. It will be observed that the factors of safety for concrete and steel are four and six approximately, assuming ultimate strengths of the two materials as 5,000 and 60,000 pounds per square inch respectively.

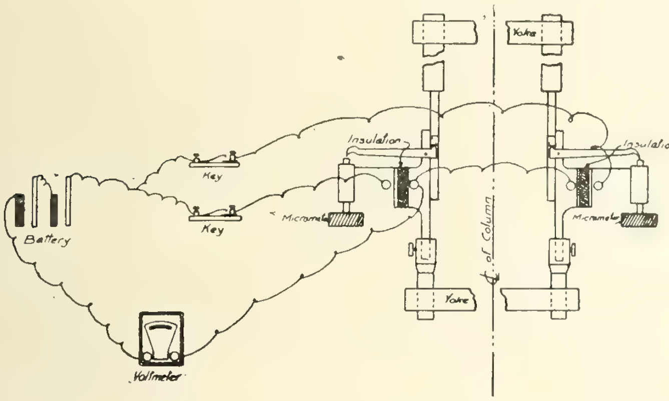


DIAGRAM OF COMPRESSOMETER DEVICE

Fig. 3

Simultaneous Stresses in Concrete and Longitudinal

Designation	Stress in Concrete	Stress in Steel
M	1,250	9,000
H	1,250	10,300
N	1,250	10,040
R	1,250	10,100
O	1,250	11,500
P	1,250	10,300
Average	1,250	10,200

This is a decided improvement over what would have resulted had the ordinary mixture been employed. In other words, through the utilization of the richer mixture, it is possible to secure a working stress for steel one-third higher than the usual one in longitudinally reinforced columns. The magnitude of the set after stressing was also very much less when the poorer mixture was employed.

The function of hoops in columns is to resist the lateral expansion or dilation which occurs when a load is applied. If there were no lateral dilation manifestly there would be no necessity for hoops. It is probably not possible to correctly express the relation between the hoop stress and the axial compressive stress in a formula. The physicist, however, on the assumption that the core of concrete in the column behaves somewhat as a fluid would under similar circumstances, has evolved an equation which purports to give this relation. The equation:

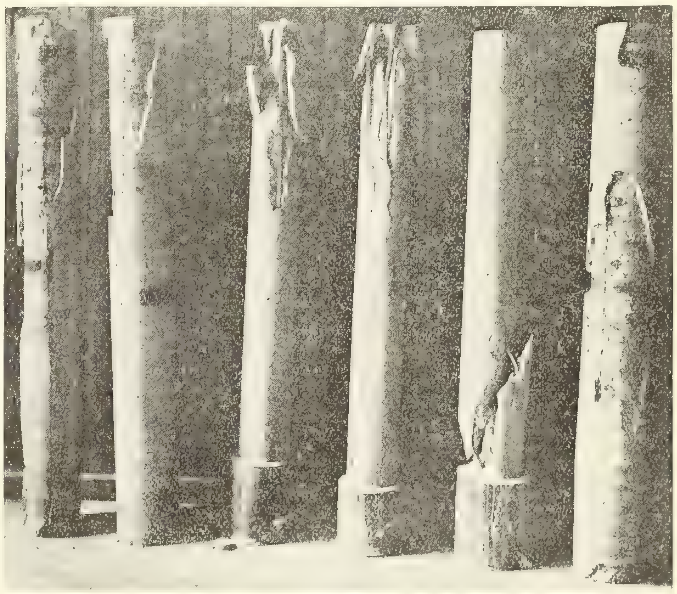
$$\frac{f}{c} = \frac{2\,nq}{2 + p\,(n - nq)}$$

in which
f is the tensile stress in the hoops;
c is the axial compressive stress in concrete;
n is the ratio of rigidity of steel to concrete;
... is Poisson's ratio, or the ratio of diametral strain to logitudinal strain, and
p is the ratio of steel to concrete in the section—

gives the relation. In n = 9 and q = ¼, as was found experimental for this material, the equation becomes

$$\frac{f}{c} = \frac{9}{4 + \frac{27}{2}\,p}$$

It is thus seen that for given materials, f/c varies only with the quantity of steel present, and since p is generally small with respect to the constants involved, the variation in f/c is between narrow limits for most cases that are likely to occur. It will be seen that the ratio is in the neighborhood of 2, which means that, theoretically, the tensile stress in the hoop (for ordinary values of p) is only twice the axial compressive stress in the concrete. The experimental determinations were, in the main, confirmatory of this, as will be seen from the following:



A group of columns after testing.

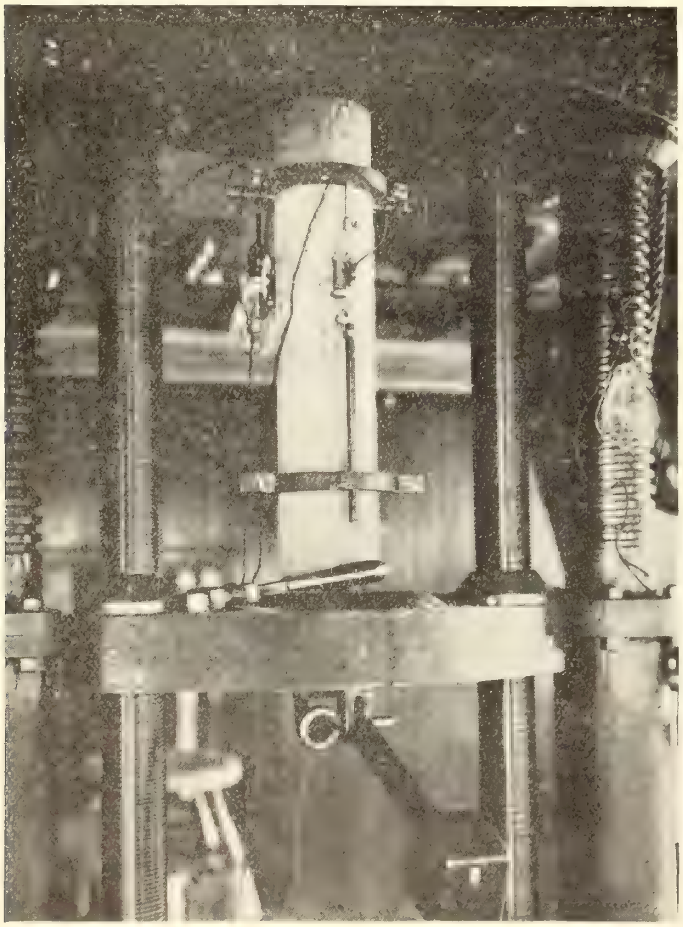
Comparison Between Experimental and Theoretical Values of f/c

Column	c.	f.	f/c (Actual)	f/c (Theoretical)
A	1,500	2,600	1.73	1.88
B	1,500	3,700	2.46	1.88
C	1,500	2,700	1.80	2.04
D	1,500	2,200	1.46	2.03
E	1,500	2,600	1.73	2.03
Average			1.84	1.97

Another feature of interest is the occurrence of what may be designated the "residual stress" in the hoops. The loading in all cases was repeated several times.

After each release, it was observed that the steel had not quite recovered its former shape as was evidenced by the incomplete backward movement of the mirrors. Moreover, this residual stress appeared to be cumulative. For instance, in one case, the amount of residual tension in the bottom hoop of one column, after the first application of load had been released, was found to be 400 pounds per square inch while, after the second loading, it was found to be 1,800 pounds per square inch. Indeed it would seem as though the residual stress were some function of the next preceding maximum stress. It must be remembered too that after a resetting of the instruments, any residual stress in the metal would not be apparent and that whatever residual stress was observed after release or load would have to be regarded solely as an increment to whatever existed prior to the last previous stressing.

The significance of the phenomenon of residual stress will be apparent. If each successive loading augments the hoop stress left from the last preceding loading, clearly a time must come when the metal will be stressed to the point of rupture. This was tested experimentally in one instance and the result confirmed the belief that such is the case. A portion of column E, which had previously sustained a load of 247,000 pounds (diameter 7 inches), was placed in the testing machine after the ends had been carefully ground to a true plane. After four repetitions of the relatively moderate load, 180,000 pounds, the second hoop from the top burst and on the fifth application the upper one severed also.



Arrangement of testing apparatus.

Figure 1 shows the manner in which the intensity of stress in the welded steel hoops is measured. It will be seen that a swelling of the concrete of the column and the consequent dilation of the hoop which encloses it will cause the mirror to rotate. The extent of the movement is caught on a graduated scale and from this the stress is computed. In figure 2, the method of measuring Poisson's ratio is shown. Again, the magnitude of the diametral dilation is read on a scale through the rotation of the mirror. The extent of the axial shortening is simultaneously observed by the mechanism shown in figure 3. The bicrometer screw and electric contact are here employed. Figure 4 shows in plan and elevation typical methods of reinforcing concrete columns.

Tests made by Professor Talbot in 1907 on hooped concrete columns using a 1-2-4 mixture, showed that the ultimate strength was increased about 669 pounds per square inch for each per cent. of hooping employed. Similarly, tests made at the Watertown Arsenal in 1906 show that one per cent. of metal in the form of hoops increased the strength of the member to the extent of 1,020 pounds per square inch. Professor Withey, in 1909, reported that for each per cent. of metal employed in the form of spiral reinforcing, the increase in ultimate strength on an average was 1,320 pounds per square inch for 1-2-4 concrete. From the above and from other tests which might be cited, it would seem as though an additional ultimate strength of 1,000 pounds per square inch for each per cent. of hooping present might be figured on.

Some years ago I made a few comparisons between the costs of columns of various materials capable of sustaining a specified load, taking the market prices of the place and time as a basis. While these prices cannot possibly apply to conditions to-day in the Canadian West, yet the conclusions would not be seriously different from what the investigation then led to, and so I propose to repeat them here. The materials laid down were assumed to cost as follows:

Cement, per barrel	$1.50
Aggregate, per cubic yard	2.00
Sand, per cubic yard	1.00
Plain reinforcing, per pound	3c
Hooping, fabricated, per pound	5c

For a 1-1 cement and rock mixture, the cost per cubic yard will be:

Cement	$8.10
Rock	1.58
Labor	1.00
Plain steel, ½ per cent.	2.03
Total	$12.71

Since the metal is added chiefly as emergency material, it will not be figured in the ultimate strength which will be taken at 5,000 pounds per square inch. A 1-2-4 concrete (the ultimate strength of which, plain, may be assumed at 2,000 pounds per square inch) will be rendered equivalent in strength to the 1-1 mixture by the use of 3 per cent. of hooping metal. The cost per cubic yard will then be:

Cement	$2.35
Rock	2.00
Sand	.50
Steel hoops	20.25
Labor	1.00
Total	$26.28

In addition to the greater cost, a column of this mixture will not possess the stiffness and probably not the margin of safety against bending stresses which are found in the cheaper column.

In order to compare the areas of three different types of column, and their cost per foot of length, it will be assumed that a 10-storey building with dead and live floor loads at 200 pounds per square foot and a roof load of 100 pounds per square foot is to be constructed. Assume also square floor bays of 15 feet on a side.

It will be seen that the load sustained by a column on the ground floor will be 427,500 pounds. This may be carried:

(a) By a steel column;
(b) By a column of the poorer grade of concrete;
(c) By a column of the richer mixture.

A reference of the Carnegie handbook, p. 141, shows that a steel column consisting of two 10-inch channels and two ⅞ inch plates will be adequate. This column weighs 121 pounds per running foot. The cost per foot of height will be :

Steel at 5c per pound	$6.05
Fireproofing, 2 inches thick	.58
Total	$6.63

A 1-2-4 concrete column with 1 per cent. of longitudinal metal will be figured at 450 pounds per square inch for the concrete and 450 × 15 = 6,750 pounds per square inch for the steel. The average stress will, therefore, be 450 (1 + .14) = 513 pounds per square inch. The gross area required will be 427,500 ÷ 513 = 833 square inches.

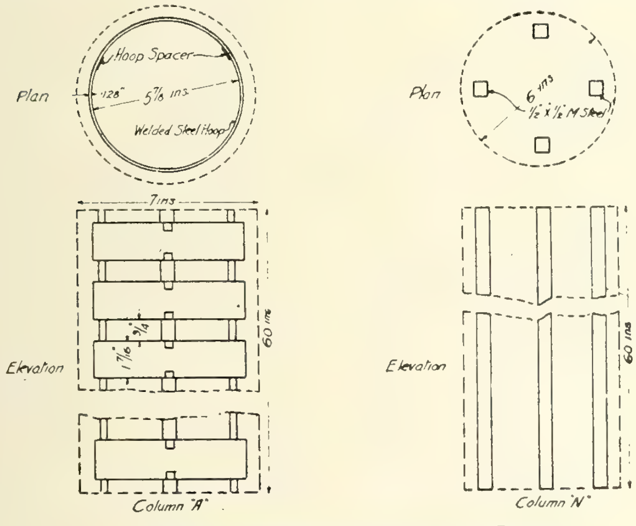


Fig. 4

Hence a column 29 inches square will be adequate. Allowing one inch additional for fireproofing, there results a column 30 inches square, the cost of which, per foot of height, would be

Concrete including 1 per cent. steel and labor.	$2.55
Forms	.46
Total	3.01

The third method employs a 1-1 mixture, the working stress on which will be taken as 1,250 pounds per square inch. The area required with be 427,500 ÷ 1,250 = 342 square inches. This is the area of a square of 18.5 inches to the side. Allowing 1½ inches for fireproofing, a column 20 inches square is obtained, the cost of which per foot of height with one-half of one per cent. of longitudinal steel would be:

Concrete including ½ per cent. of steel and labor	$1.30
Forms	.32
Total	$1.62

The areas of the cross-sections in the three cases are:

(a) 1.8 square feet.
(b) 6.3 square feet.
(c) 2.8 square feet.

It is thus seen that the difference between the smallest cross-section and the largest is 4.5 square feet, an item of considerable importance in districts where the rental of floor space is high. On the other hand, the difference in cross-sectional area between the most expensive method of carrying the load, and the cheapest is 1 square foot. Having regard then to the fact that the rich mixture column costs only one-fourth as much as the steel structure there would seem to be a good deal to be said in favor of the stronger mixture.

Inferences

Your consideration is invited to the following inferences to which the data at hand seem to lead:

(1) For a 1-1 mixture, a working stress of 1,250 pounds per square inch seems to be justified:

(2) The rich mixture is more uniform in its elastic properties than is the lean mixture, and for proportionate stresses the permanent stress is likely to be much less.

(3) The use of steel longitudinal for reinforcing columns gives an increase in strength very much less than the proportionate increase in cost.

(4) The porosity at the top of the column is likely to be a source of localized weakness.

(5) The employment of a rich mixture in columns permits of the more economic stressing of the steel longitudinals.

(6) The stress in steel hoops appears to be approximately twice the axial compressive stress in the concrete core.

(7) An approximate increase in ultimate strength of 1,000 pounds per square inch for each per cent. of metal employed may be figured on for hooped columns in excess of that existing in plain columns of the same mixture and age.

(8) Owing to the pseudo-plastic condition of the concrete within the hoops, the reinforcement does not completely recover its unstressed conditions after the removal of load. The residual stress resulting is probably augmented by each successive load, and finally rupture of the hoops occurs.

A chimney of unprecedented size has been built at the smelter plant of the Boston and Montana Consolidated Copper and Silver Mining Company, near Great Falls, Montana. It is 506 ft. high above the top of the foundation ring, and 50 ft. in interior diameter at the top. It is the highest in the world by about 40 ft., and the highest in the United States by 140 ft., the Eastman Kodak chimney being 366 ft. high, and the Orford Copper Company's chimney being 365 ft. Its discharge capacity is 4,000,000 cubic feet of gases per minute, with a draught of 3¾ in. water expected with gases at 600 deg. Fahr. average. The height was governed solely by the draught requirements, and not by the desideratum of discharging high enough in the air to prevent creation of a nuisance. This latter requirement is met by the existing stack, which is but 186 ft. high, the city of Great Falls being 500 ft. lower than the table land, and the valley being 250 ft. to 300 ft. lower.

Modern Principles of Machine Shop Design

THE laying out of machine shops must depend on the area, the shape of the ground available, and the nature of the product manufactured by a firm, says Industrial Engineering. The aim should always be to avoid handling materials and products more than is absolutely essential. To this end certain relations of shops to each other, and to railway sidings or canals, will have to be observed, in addition to the internal designs of the shops, the placing of heavy and light machines therein, and the systems of industrial railways and dispositions of hoisting machinery; so that the main problem includes much detail that varies with the requirements of different classes of manufacture.

With respect to the relative positions of shops as affecting the handling of work, two general cases arise. One is that of concentration in a few buildings, the other their isolation in separate buildings. In a large degree the choice between these depends on the size of a concern. The larger it is, the more desirable does the isolation of shops and of departments in shops become, partly because the necessities of supervision, partly of those of higher specialization. A small firm can carry on its machining and assembling work all under one roof, in charge of one foreman. A very large works must not only separate these departments, but must also create sub-departments in each, for light and for heavy work at least; and very often further sections must be arranged according to the class of machine used, as planers, drills, gear cutters, grinders, and so on. Then the question arises whether all these shall be included in one large shop covered by one roof, or be housed in separate buildings or on distinct floors, which can be decided only for each individual firm. Speaking broadly, the present tendency is towards isolation where the work done is of a sufficiently standardized and repetitive character to justify it.

Economic Hauling

But whatever arrangements are adopted, the cardinal element of economical haulage and handling must not be lost sight of. Raw materials—bars, castings, and forgings—should be taken in, and should, with the articles manufactured from them, not return on their tracks, but should progress from shop to shop, or department to department, in orderly sequence; and this idea must be uppermost when locating the positions of those departments in which preparatory work has to be done, as the casting, forging and plating departments, and the stores for iron and steel. Raw material should, as a rule, be utilized first nearest the point of debarkation. The heavy machine shops into which castings and forgings have to be taken should be located nearer to the foundry, forge shop, or boiler shop than the department in which light work has to be done.

It is well as a rule, when work is for the most part heavy, to conduct operations so far as possible on the ground level. There is, however, always a proportion, greater or less, of light work, and this can well be conducted on upper floors, or in galleries running round a shop, the latter usually having preference. In shops in which most of the work is light, as in the manufacture of small motors, brass fittings, and articles of similar bulk, floors and elevators can properly be utilized. But lack of light renders fine work difficult on dark days, and runs up the bill for gas or electricity.

Instead of building in the heart of a crowded city, most new factories are now erected in the suburbs of cities, or out in the country where ground is cheap and room for extension is ample, and where healthful cottage homes can be built for the workmen.

The arrangement of shops on a ground floor only is the modern ideal in factory design, and it is one which is admirably suited for engineering works. The work being mostly of a heavy character, its manipulation is awkward on upper floors, but if it can all be dealt with on a ground floor it can be run in and out, handled with hoists and cranes, while all the trouble of lifting and lowering from upper floors is avoided. Supervision, again, is easier on one floor than on several. A manager or foreman can have more men under more effectual observation, whereas different floors require either extra foremen or divided attention. Hoisting machinery can be more efficiently installed on a ground floor shop than in a building of several storeys.

Character of Buildings

With regard to the buildings themselves, it is better and cheaper to build one-storey shops than those with several floors. The walls, having no floors to carry, need not be so thick, and there is no expense for heavy joists, floor planking or concrete. More light can be admitted from the roof than from windows in walls, and a north light can be obtained with a saw-tooth roof, which avoids the direct glare of sunshine. With regard to the walls, in most engineering works they are made to fulfil other functions besides that of sustaining the roof. Details which have to be considered are the support of travellers and jib cranes, of main lines of shafting and counter-shafts, and sometimes of machines, such as wall planers, drills, etc., in whole or in part. Brick walls alone are not nearly so suitable for the fulfilment of these functions as are metal columns. This is one cogent reason why columns are generally preferred to brickwork, and it is all in favor of the ground floor shop in which columns take the place of brick walls as supports, the wall often being a mere filling in of a brick course, or even sometimes of sheet iron, between the columns.

Further, the modern shop ideal is to have an unbroken width across two, three, or half-a-dozen bays. Each bay has its own roof, but the bays are separated only by columns, which leave clear wide spaces across the entire width that is enclosed by the outer walls. The columns, of cast iron or structural steel, are made to suit exactly the requirements of the shop, with flanges and brackets to receive the gantries of overhead cranes, the pivots of swinging cranes, bearings for shafting or countershafts, and attachments for wall machines. In the event of future shop extensions these bays can be carried out lengthwise by making more identical columns, preserving the uniformity in width and height of the shop. In a well-lighted shop built on this model there is no objection to the erection of galleries of moderate width, provided they do not interfere with the employment of suitable hoisting tackle. They would sometimes block the way of an overhead traveller, but the latter is not required in light departments. Moreover, galleries need not occupy all the length, and they may be raised higher than the crane gantries. Where space is limited the galleried shops often offer the best solution of a difficulty.

Hoisting Machinery

Hoisting machinery is a costly item, and one in the laying down of which the best judgment is required. There are so many systems of hoisting adopted now that it is difficult to give statements of general application. But the following considerations should have weight. In the shops themselves the choice lies between overhead tracks with hoists, overhead travellers, and walking or single-post cranes. The choice of the first two should be favored because they leave an absolutely clear way beneath. But many firms employ the walking cranes, especially in machine shops. Wall cranes will often be needed both for light loads and the local service of heavy machines. Floor trolley tracks are often used. In the yards there should be travelling steam or electric cranes to go wherever required for unloading or loading, for hauling or pushing, in the absence of a yard locomotive.

The hoisting mechanisms for light service which run along the overhead tracks may be divided into two great groups; those which are trolleys only, having eyes from which the actual hoisting machines are suspended, and those that combine the travelling and hoisting tackle in one. The first-named are mostly of the direct lift types, worked by hand, pneumatic, or hydraulic power; the second are electrical. In the hand hoists pulley blocks are suspended from trolleys pulled along by hand. In the pneumatic and hydraulic types the movement of a piston or ram in a cylinder is equal to that of the lift. In electrical hoists toothed gears, drum and wire rope are employed, driven by the motor located on the trolley. The movements of the latter may be controlled from a distance, but more commonly dependent rods with handles are employed, so that the men standing by their loads can operate the hoist from the floor. So extensive are these developments that several firms in England and America make a specilty of the fitting of overhead tracks and light hoists for them. For heavy duty overhead travelling cranes are practically universal. They are made in many styles and powers to suit all conditions, operated from above and from the floor, and as a rule now each motion is provided with its own separate motor.

Alternative to the overhead tracks are the walking or single-rail cranes, which have for a long time been favorites in the machine shops of the Manchester district and north country shops. They occupy only the room in which they happen to be engaged for the time being, and the single line of floor and overhead rails does not block the shop much. As they are slewing jib cranes, they cover an area corresponding with the entire sweep of the jib.

Floor Trolley Tracks

The question of floor trolley tracks is often difficult of settlement. Where they come into rivalry with overhead tracks is in the handling of work seldom exceeding from one to two tons in weight. The advantage of the overhead system lies in the fact that the floor is left clear. It is not desirable to occupy a shop floor with tracks where heavy articles are being handled, or where the area available is not ample, or in a small shop or department where the work is all of a very light character. All such areas are best served either with overhead travelling cranes or with overhead tracks with hoists, supplemented, if need be, by swinging cranes to serve heavy machines. The ideal arrangement is to run the floor trolley lines up to the entrance of the department or shop, so making connection between it and the outside, but to serve the shop area with overhead tracks. Another objection to tracks in some shops is the presence of turntables. Speaking generally, the fewer of these the better. They can often be avoided by making connections with curves of large radius and switches.

The altruistic side of a works is not neglected in shops that are built now. In the best shops every man has his seat in the dining room, a wash basin, and a reserved and numbered locker. In some a regular kitchen and chef are provided and the men are supplied with properly cooked meals and various drinks at cost price.

A GROWING interest in the subject of preserving timber against decay is being manifested by the users of railway ties. This is largely due to the rising price of woods such as cedar, which resist decay without any special treatment. A British firm has recently established a large plant, 28 acres in extent, at Fort Frances, Ont., for preserving ties by means of zinc chloride with the addition of sulphate of alumina to prevent leaching. The prepared solution is forced at high pressure into thoroughly seasoned lumber, so that it permeates every part of the wood, and being aqueous, readily mixes with any slight moisture that may lurk in the inner pores. Wood treated in this manner has been reduced to sawdust, washed for over an hour, and yet still contained a large proportion of zinc chloride. This compound has the further advantage, as compared with creosote, of cheapness, and of being colourless and odourless. Moreover the preserved wood may be painted or polished.

The causes of destruction of railway ties, in order of importance, are decay, mechanical wear and insect pests. Treatment with zinc chloride or creosote will so overcome decay as to more than double the life of a tie, and will keep away the insect pests entirely. Mechanical wear may be reduced by the use of flat tie-plates of either metal or hardwood to lessen the cutting of the rail base, and of screw spikes to minimize the wear due to spike pulling. Though at present such devices are not common outside of Europe, yet with the growing employment of soft woods such as jack pine and spruce, some such precautions will shortly need to be adopted in Canada, perhaps with the anomalous result of giving us a safer track.

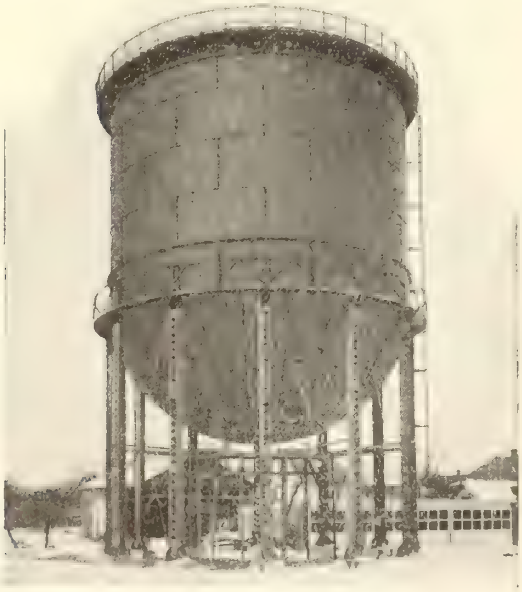
In good practice it might be best to give the number of square feet superficial of wall, and give the thickness. The same method is adopted with each storey, with its varying thicknesses of walls, every dimension being entered in precisely the same order, with its particular location noted.

When rough cutting to brick work is required, every square foot of it should be measured. Brick work in footings or foundations, or walls below ground or at unusual heights, should be all segregated and given separately, with full descriptions.

Railway Equipment Installed in Canadian Northwest

THE extremely severe winters which are experienced in Northwestern Canada along the route of the new Grand Trunk Pacific Railway have caused the railroad engineers to devote considerable time and study to the question of a suitable water supply for locomotives which would be available at all times. In addition to the extreme cold which would freeze solid a small outlet pipe in an ordinary locomotive supply water tank, there is also so great danger of forest fires, so we may say that the conditions to be met are,—

Steel railway water tower, used on G.T.P.R.R. capacity 100,000 gallons



Typical railway tank with spout, capacity 50,000 gallons

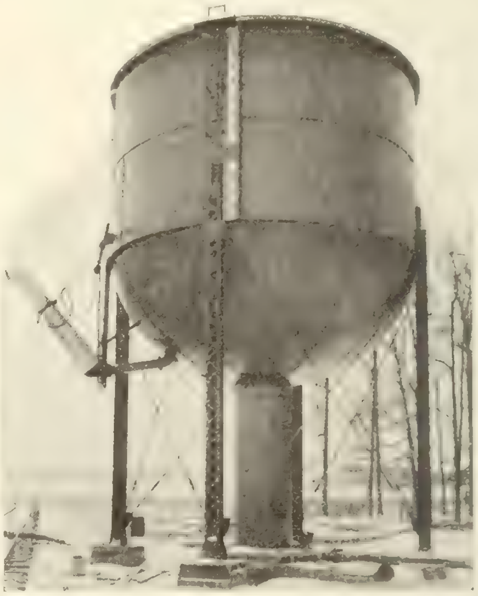
(1) Absolutely certain storage with no danger of leakage or bursting of tank.

(2) Water must be available at all times—i.e., must be protected from freezing.

(3) Storage tank must be fireproof.

It was first agreed by the Grand Trunk engineers that the only structure which would be water tight, fireproof, and permanent was a steel water tower. But an ordinary water tower would not do. Provision had to be made for heating the water in winter, so the leading manufacturers of steel water towers were called upon to submit suitable designs for this work.

We show herewith the photograph of a structure similar to the twenty-nine which the Des Moines Bridge & Iron Company of Pittsburgh, Pennsylvania and Des Moines, Iowa, are building to meet these conditions. Each tank is constructed entirely of steel. The most interesting feature from an engineering point of view is the heating system. The tank is built with a large rivetted steel riser pipe, six feet in diameter, which is constructed to provide for the expansion and contraction induced by the temperature changes in the supporting tower or columns. At the base of this riser pipe is a roomy concrete heater chamber in which may burn either coal, gas or oil. Four 2-in. hot air pipes run from this stove up through the tank to a ventilator in the roof. This hot air system is sufficient to keep a circulation in the tank and outlet pipe during the most severe winter weather. The heater chamber also serves as a valve house from which the tank may be cleaned of any sediment which collects in the water and accumulates in the large riser pipe.



Large railway water tank, capacity 56,000 gal. height to bottom 17 ft. 10 inches

The contraction and expansion of the supporting tower may be provided for conveniently at one or two places, either at the connection of the riser pipe to the tank bottom by means of a water-tight expansion or slip joint, or as in the case of the new structures for the Grand Trunk Pacific Railway, by allowing the entire six foot riser pipe to move on the outside of the concrete heater chamber at the base. The latter method suspends the riser full of water from the tank bottom which would not be possible in the case of a water tank on a high tower. On the contrary, the method of using a properly designed expansion joint may be applied to any structure whatsoever, and for this reason, would appeal to the engineering profession. A rather interesting example of this is the 150,000 gallon water tower which the Des Moines Bridge & Iron Company is building at present for the Department of Public Works, Province of Manitoba to be used at the Agricultural College at St. Vital, Manitoba. This structure has a six-foot diameter riser pipe which is 125 feet high and the expansion is taken care of at the connection to the tank bottom by means of a special diaphram expansion joint.

The installation of steel water towers on the Grand Trunk Pacific, Canadian Northern and in fact all the large railroads in Canada, is a noticeable and significant fact in itself. It proves that these roads are being built and supplied with the most modern and efficient equipment which it is possible to buy. In this respect, the Canadian lines are a step ahead of some of their older neighbors in the United States, but without exception, we may say that the most progressive roads are using only steel structures for water and coal storage, and are rapidly replacing the old, worn-out wooden equipment.

The twenty-nine steel water towers mentioned above as being covered by a recent order placed with the Des Moines Bridge & Iron Company of Pittsburg and Des Moines by the Grand Trunk Pacific, are all being fabricated at the company's Pittsburgh plant. The design and details of construction were approved by Mr. J. G. LeGrand, bridge engineer, Grand Trunk Pacific Railway, Winnipeg, Manitoba.

Difficulties Encountered in Smoke Elimination

SOOT has a two-fold destructive action, first, physical, and second, chemical. An analysis shows that it consists of carbon in a finely divided state which absorbs corrosive acids produced in the combustion of coal containing sulphur; tar which makes it cling and contains carbolic acid; sulphurous acid, sulphuric acid, sulphuretted hydrogen and hydrochloric acid, these corrode metals and attack even stone buildings and decorative substances; ash which settles just as dirt and ammonia and arsenic in very small quantities. Its physical power of destruction consistis in soiling surfaces by depositing carbon and tar, the latter acting as an adhesive for dirt. Through chemical action it destroys by the tarnishing and the corrosion of metals and even by attacking stone, brick and terra cotta. In these days, large business firms display a penchant for erecting fine office buildings and warerooms of costly material and frequently with some pretense of architectural beauty, but business convenience compels these structures to be erected in the proximity to factories and railway lines, much to the detriment both of the material and the external appearance. It is interesting to note the attempts to prevent this destruction through smoke and with this in view we publish an address on this subject by Mr. D. F. Crawford before the 20th Century Club of New York City.

Chief Smoke Producers

The largest proportion of the smoke emitted in any locality where bituminous, or soft coal, is generally used, may be attributed to one source—that is, the stationary boiler which supplies the steam power for so many purposes.

From a point of vantage in almost any city on a cool morning a glance around the horizon will disclose the vapour of steam arising from many buildings, including with those used for strictly manufacturing purposes, many hotels, office structures, stores and apartments. At practically every point where the vapour is observed there is a possible source of smoke emission and where any considerable quantity of smoke arises from sources such as mentioned it may be attributed generally to one cause, namely, the capacity of the boiler plant is insufficient for the work imposed on it.

If a boiler having a capacity of say 100 horse-power is not loaded beyond 75 horse-power there is very little probability of smoke, unless the plant is very carelessly handled. If loaded to its rated capacity, with careful handling, but little, if any, objectionable smoke will be produced. However if the boiler be loaded beyond its capacity, it is difficult if not impossible, so to handle it as to prevent objectionable smoke.

The greater part of the smoke emitted in any of the large cities may be eliminated by insisting that the owners of manufacturing plants and other classes of buildings mentioned provide boilers of adequate capacity.

Next in importance as smoke producers are the many fires used in a city for domestic purposes. Each individual fire produces only a small quantity of smoke but in the aggregate their contribution to the smoke annoyance is very large indeed, but in some cities the smoke and gases from this source exceed that from all others. It is a matter of record that the heaviest black fogs in London occur on Sundays and on Christmas Day, or other holidays when the manufacturing plants are closed. While the smoke from fires used for domestic purposes does not attract the attention as much as that from a large plant, the effect on objects with which it comes in contact is greater on account of the fact that the smoke from small slow fires contains considerably more tarry matter than that from large fires burning at high temperatures. The soot contained in this tarry matter adheres more firmly to the buildings, people, clothing, etc., than does the soot which consists principally of carbon coming from fires of greater intensity.

In the cities which are adjacent to rivers, lakes or harbors, a considerable portion of the annoying smoke comes from the water craft, where the problem of producing a large amount of power with limited space tends to make the boiler plants small in comparison with the work required.

While it is true that locomotives produce a certain proportion of the smoke in localities where they are used, it is a fact that if all of the locomotives in use were to cease making smoke but twenty to forty per cent. of the smoke of cities such as Philadelphia, Chicago, Cleveland and Pittsburgh, would be eliminated leaving from sixty to eighty per cent. of the smoke now existing to trouble us.

The railways of America produce transportation of passengers and freight at the lowest cost of any in the world, and to obtain this result large locomotives and consequently large coal consumption, is necessary and large coal consumption with comparatively small boilers means smoke, as before explained.

The dimensions of the boiler must be confined to the permissible limits of width and height clearance, the length must be made to conform to the limit of practicability, and for these reasons it is impossible to increase the capacity of the boiler. The further reason that the public demands rapid and luxurious transportation makes is impracticable to reduce the work required of each unit.

Destruction Caused by Smoke

The railways are most vitally interested in the elimination of smoke for economic reasons, for while smokeless combustion does not always mean economy, combustion with heavy smoke always indicates loss and as many millions of dollars are spent annually for coal even a small saving per locomotive would make a large sum in the aggregate. The property of the railway adjacent to the tracks such as stations, bridges, signals, telegraph lines, etc., is damaged and deteriorated by smoke, requiring large expenditures for renewals, as well as for maintenance such as painting and cleaning.

The possibility of largely reducing the expenses for these items without reference to the point of view of the aesthetic or personal comfort, has been a sufficient incentive to cause the railway people to give the smoke subject a large amount of consideration.

The railway officers and employees suffer the annoyance caused by the smoke to the same or even greater extent than do the patrons or others who are located near the tracks, as their occupation requires almost continuous proximity to the smoke source.

The personal interest, the interest of the community, added to the possibility of the savings mentioned above, has led to almost continuous study of the locomotive smoke problem. This study has extended over twenty-five years to my personal knowledge, and from the records, many years farther back.

During the last fifteen years I have examined drawings and patents of many devices which were supposed to eliminate smoke, and made personal observations of their performance. Unfortunately, but very few of these were even promising, and if worthy of installation and trial, the results obtained were not such as to warrant using the apparatus in regular service. The Pennsylvania Railroad System has devoted a great deal of attention, and expended a large amount of money, in experimenting with and developing, either on its own account, or in co-operation with representatives of other railways, or the technical societies, devices which gave promise of reducing the smoke from locomotives and in 1910 the management sent a committee of three to Europe to study conditions and results obtained with the various devices and methods in use there, for comparison with the practice in this country.

Many Unsuccessful

For many years devices designed to admit steam or air into the fire-box have been used as a means for reducing smoke, with generally unsatisfactory results. During the past year, however, a device for supplying air to the fire-box was developed and subjected to rigid and painstaking scientific study. Tests were made at the testing plant of the Pennsylvania Railroad, and the results were confirmed by carefully watching the performance of the locomotives in regular service. This device considerably reduces the amount of smoke under some conditions, and the results obtained so far are sufficiently promising to permit extending its use, especially for the smaller locomotives.

During the past nine years there has been developed on the Pennsylvania lines west of Pittsburgh, a device which, up to the present time, is the most promising yet produced for the reduction of smoke, and in fact under favorable conditions, the practical elimination of locomotive smoke. I refer to the locomotive stoker, with which one hundred and fifty-four locomotives have been equipped, and one hundred and forty more are under construction.

With this stoker we have succeeded in greatly reducing the amount of smoke emitted by locomotives in heavy passenger train, freight and switching service. Repeated comparisons of the smoke made by locomotives with and without the stoker show that those equipped with the stoker may be operated with from one-tenth to one-fourth of the smoke made by similar locomotives in the same service without the stoker.

As stated above this is the result of nine years' experimentation and development, but now while the apparatus is sufficiently developed to warrant the trial of a large number, the problem of maintaining, and satisfactorily operating them, with various kinds of coal, is still before us.

What does this mean to you as to reducing the annoyance from locomotive smoke? Only this—that there are now in existence two devices for reducing the smoke which are sufficiently promising to make it probable that the use of them will be extended and that the information obtained from them is likely to lead to the development of others.

In addition to the study and development of mechanical devices for the elimination of smoke, the railways, by additional supervisors and instructors, are causing reduction in the amount of smoke emitted by having more careful firing and handling by the engine man, and are making a comprehensive study of the problem of reducing the amount of smoke about engine houses where fresh fires are made, the smoke from which is the most difficult to control.

All of this shows that the railways are keenly interested in this subject, and in addition thereto the American Railway Master Mechanics' Association has a committee studying the problem, and the railways are also co-operating with the various other associations, and city officials interested.

Of course, one way to eliminate locomotive smoke would be to eliminate the steam locomotive by substituting electric motors. No doubt from time to time the use of electricity will be extended but it must be borne in mind that to do so will require tremendous outlay of capital for the installation, and it does not yet appear, except under the most favorable circumstances that the expenditure will be warranted by the returns. Further, if the railways are electrified there will still remain from sixty to eighty per cent. of the existing smoke to be dealt with.

A careful study of all accidents, no matter what their nature, has been made by the Pennsylvania Railroad, during the past year, and it has been found that probably 75 per cent. of them could have been prevented if the employees had exercised special caution. This has led to the publication of a booklet entitled "Safety Hints and Suggestion for the Prevention of Personal Injury Accidents."

Efficiency of Concrete in Road Work

(Contributed)

Concrete paving material for both city streets and country highways has been developed rapidly in the United States in the last few years, and has proved to be a durable and economical means of solving traffic problems.

The use of concrete for pavements in the case of cities and particularly in the case of large towns, is on the increase. Its success in this capacity has been uniform. Various types of construction have been developed, chief among which are the single course, two course, and reinforced pavements.

The use of concrete as a material for the construction of rural roads promises to develop into the standard type for that class of construction work. It has already been used in a majority of the States in the Union and it has met satisfactorily the demands of traffic, both of the old horse-drawn type and the newer motor propelled type. At the same time it stands out as the one material within financial reach that will provide road service economically for any long period of time.

The road situation is such that far greater sums of money are expended annually on road repair than on the construction of new roads. For example: In 1911, $142,000,000 were spent for road improvement, and of this sum $102,000,000 was expended for repair and maintenance, while only $40,000,000 was expended on new construction. To complicate the problem further there is no system to control the building of the tremendous mileage of roads in the United States, and even many of the States have no jurisdiction over the construction of roads in the various counties and townships. Therefore, the road building is a local, rather than a State or National problem, and the residents of various communities must depend upon their own efforts for the improvements of their roads. Under the present conditions the county is the logical road building unit, and each county must solve its own problems to the best advantage.

Even under such adverse circumstances, when any type of road construction is liable to be improperly built, concrete has shown a remarkable durability and has given road service far in excess of the gravel or the macadam types that are prevalent in the country.

A second phase of the road situation is the necessity of road types that will withstand automobile traffic At the present time there is already an enormous number of automobiles in use on country highways. In the near future the motor truck will undoubtedly come into large use as the means of transporting the country's agricultural products to the city. This will further necessitate the type of road construction that will withstand the ravages of motor propelled vehicles. In this connection it will be noted that the funds previously spent for road types of gravel or macadam will be practically wasted. In 1907 the State of New Jersey had a large mileage of macadam which was well adapted to the horse-drawn traffic of that period, and spent but $600,000 for road repair during the year. In 1908 the charges jumped to $800,000; in 1909, to $1,421,000 and in 1911 to $1,565,000. These increased repair charges were in close proportion to the increased number of automobiles in use in the State. The figures show conclusively that a more permanent type of construction is necessary. Even the later types of bituminous and oil-bound macadam that were built after the European method of construction, in the hope of finding a type less expensive to maintain, were found to reduce the cost of road repair but little, and it came to be conceded by engineers generally in the various counties and states, that brick or wood block paving similar to city construction was a necessity for rural roads.

In the meantime, however, the road commissioners of Wayne County, Michigan, found a satisfactory solution of the road problem by means of concrete, built in much the same manner that the concrete pavements under brick and granite blocks are built in the

A concrete road, believed by engineers to be a solution of the road problem in the United States.

cities. Detroit, which is the metropolis of the country, is one of the largest automobile centers on the continent. In general it is the automobile owners who are the keenest advocates of road improvement ,and the automobile interests in Detroit were largely instrumental in the raising of funds for the construction of concrete pavements built in Wayne County.

This brings to light still another peculiarity of the road situation. Without question the agriculturists are the ones who profit most by road improvement and they are at the same time the class that objects most strenuously to road taxation. These Wayne County roads were experimented with at first and when the Board of County Road Commissioners had satisfied themselves that concrete was both adaptable to traffic conditions and sufficiently permanent to be a real economical type of construction they invested $65,000 in the purchase of road building equipment so that the work could be prosecuted advantageously and economically. Almost with the first mile of pavement built, the sentiment among the farmers of the county changed, and there was a demand for more concrete roads over which four or five times larger loads could be hauled. The county bonded itself for $2,000,000 for the continuance of the work, and at the present time Wayne County has eighty miles of roadway that is a distinctly American type, and meets the traffic conditions so satisfactorily as to more than justify the expenditure.

These pavements have attracted the attention of road builders all over the United States and Canada. Almost daily road officials inspect the pavements and return home satisfied that they have seen the solution of the American road problem. European engineers visiting this country are astonished at the permanency, and at the low cost of maintenance of the roads. And at the present time the United States Office of Public Roads is experimenting with concrete, after careful inspection of the Wayne County work.

The initial cost of concrete in Wayne County is about $10,000 a mile for a sixteen-foot roadway seven inches in thickness. This is somewhat higher than the cost in other localities where sand and gravel are easily obtainable. The cost of maintenance of these roads is nominal, averaging less than $10 per mile per year, and the larger part of this cost of maintenance is spent in rounding up the gravelled shoulders of the road, cleaning out the ditches—an expense that is necessary with any type of road.

On the other hand the cost of properly built macadam or gravel, the heretofore prevailing types, ranges from five to eight thousand dollars per mile. And the cost of maintenance, particularly in the eastern states, where the automobile traffic is heavy, ranges from eight hundred to two thousand dollars per mile per year. In addition to this the life of macadam is but four or five years, while concrete may be safely counted upon to last at least twenty years. In addition, concrete has a further advantage of affording better road service throughout the entire period.

Thus it may be seen that although the outlay for concrete is slightly greater than for macadam or gravel it is really a far more economical type of road construction when considered for a period of anything over five years. As these pavements are now built they are similar in construction to the concrete foundations used under the heavier types of city pavements, and no doubt when their period of service as a pavement proper has ended, they can still be utilized as foundation material under brick, and still give service for an additional twenty years. And these facts account no doubt for the nation-wide adoption of concrete for pavement purposes.

A Wayne County, Michigan, concrete road

Co-operation is the first purpose of organization. The employee who lacks loyalty to his employer can at best render but half-hearted service. The employer who secures loyalty of his men, not only secures better service, but enables them to accomplish more with less effort and less exhaustion.

City of London Incinerator

The city of London, like several other leading Canadian cities, is modernizing its system of garbage disposal. The system adopted is that followed in most of the European countries of high temperature incineration.

With the attention that has been given to the question of incineration within the last few years, it is scarcely necessary to define the difference between this system and the low temperature furnaces, which about forty years ago were in use in England. These plants were all operated by natural draft, with a rate of burning of about six tons per twenty-four hours, on a grate area of about 30 square feet. An example of this type of furnace is still in use in the city of Montreal. This furnace was designed and erected some twenty-five years ago under the supervision of an engineer from one of the British destructor companies. The slow rate of burning is quite apparent. No attempt is made to utilize the products of combustion.

In the early style of furnace the temperature was probably not much above 800 degrees, whereas in the modern type utilizing forced draft a temperature of 1,800 to 2,000 degrees is employed with the result that the heat can be utilized for the production of steam. At the same time, this high temperature ensures absolutely the complete combustion of all gases; consequently, there is never any objectionable odor emitted from the stack.

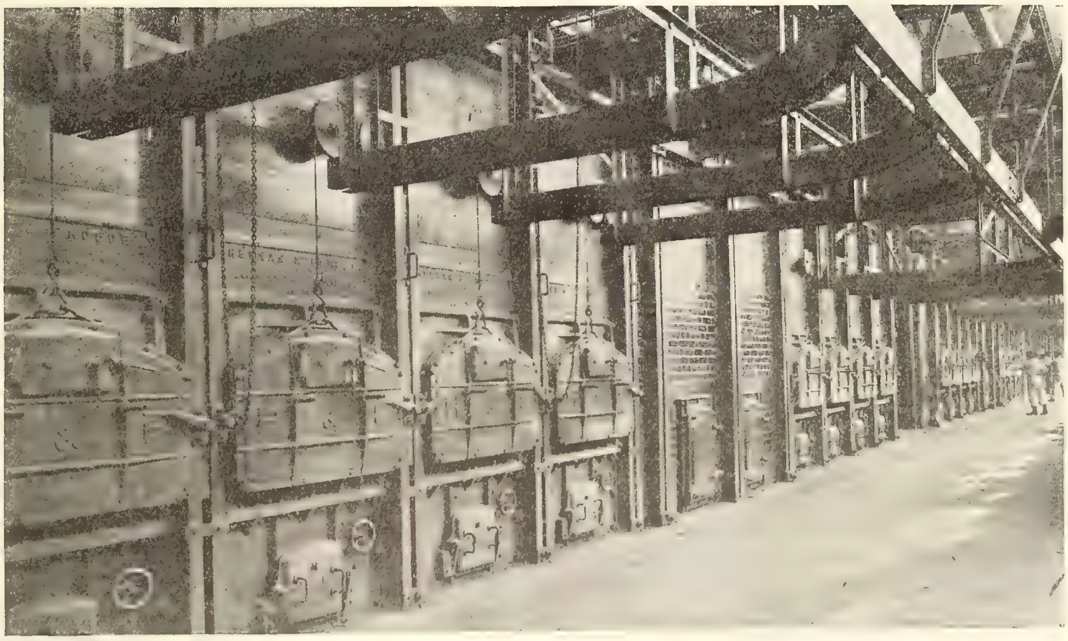
The London destructor, which is of the Heenan & Froude type, is of sufficient capacity to destroy fifty tons of refuse per twenty-four hours, with a guaranteed minimum temperature in the combustion chamber during the ordinary operation of the plant of not less than 1,250 degrees. The plant consists of three cells or burning chambers of the "trough" grate type. This type of grate is a considerable improvement over the original flat grate, as it allows the forced draft to reach the garbage not only from underneath but from both sides. This type of grate also permits of mechanical clinkering, which is one of the most important improvements made in recent years.

The accompanying cut is an excellent illustration of a four-cell Heenan incinerator recently installed at Rotterdam, Holland, and is similar in type to the plant now in operation in London, Ontario.

The form of the "trough" grate is plainly indicated in this illustration by the clinkering door. During clinkering this door is raised by means of rope, pulley and balance weights. A clinker truck is run on the rails up to the cell door. A chain is hooked to a drawbar resting in the bottom of the cell and extending its full length. When ready for clinkering, this movable drawbar is pulled forward by means of the chain and winch into a truck, of the right size to receive the whole contents of the cell. By this means, the clinkering operation, which in the plants erected three or four years ago occupied ten to twelve minutes per cell, is now being performed in less than two minutes, the result being much higher efficiency on account of the short time the cell doors are open, and it also very considerably reduces the labor of the operator.

The garbage will be brought into the incinerator building on the upper floor and dumped direct into hoppers, the foot of which will be on the charging floor. The operation of charging is very simple, the garbage being raked forward into containers and placed in the top of each cell. Each container holds sufficient for one charge. When charging, the top door of the container is closed, and a door opening direct into the cell is withdrawn, the whole charge being thus deposited on the grate.

The garbage is consumed without additional fuel



Type of incinerator erected at London.

of any kind, and as each cell is charged and clinkered at different times, the fire in the adjoining cell is sufficient to ignite the newly charged refuse, burning being maintained at a high rate by means of the forced draft system. The air for the forced draft is expelled by a large fan operated by a direct connected enclosed type engine. Before passing into the grates the air is heated in a regenerator consisting of a large nest of tubes, through which the hot gases from the furnace pass on their way to the stack. By this means, the air is brought from a temperature of about 60 degrees to over 200 degrees before it reaches the grates.

The smoke and heat from the cells passes directly into a combustion chamber the construction of which is such that it produces a thorough mixing of the gases and the greatest heat is obtained. This is sufficient to complete the combustion of all gases and particles of unconsumed matter carried over with the smoke. The process going on in this chamber is indicated by the deposit which results. This deposit consists of an exceedingly fine soft dust, and this is absolutely sterilized. In some European countries this deposit is used in the manufacture of toilet-powders.

After leaving the combustion chamber, the volume of intensely heated air passes through a Babcock & Wilcox boiler in which an evaporation is guaranteed of 1¼ lbs. of water at 212 degrees per lb. of garbage. After passing through the boiler and air regenerator above referred to, the product emitted from the stack is such that absolutely no nuisance of any kind is caused.

The erection of the London plant is in charge of Mr. H. A. Garratt, who is an incinerator engineer of fifteen years experience. He came to London direct from Rotterdam, Holland, after erecting the large plant illustrated.

The London contract is being carried out by Heenan & Froude of Canada, Limited, of which Messrs. Laurie & Lamb of Montreal, are managers. Previous installations carried out by them are in successful operation in Westmount, Moose Jaw, and Calgary.

Storage System for Construction Plant*

An equipment of plant necessary for the creation of structural steelwork, especially buildings, is stored at Greenpoint, Brooklyn, by Post & McCord, Inc., New York, for use in New York and the immediate vicinity. The plant consists of standard apparatus and ordinary tools and supplies sufficient for the requirements of twenty or thirty erection gangs under ordinary conditions. This equipment has an inventory value of approximately $100,000 and is constantly being replaced and added to. At the completion of every contract the erection plant is invariably returned to the storage yard, inspected, repaired or renewed if necessary, and put in order before it is permitted to be used on another contract.

Storage of Derricks, Timber and Engines

The storage yard has frontage on Newtown Creek, where a large proportion of the heavy plant is received from and delivered to lighters by a set of three wooden guy derricks with 65-ft. booms of about 12 tons capacity, operated by hoisting engines, equipped with Crocker-Wheeler 7 h.p. electric motors. The derricks are located on a line perpendicular to the shore line and interlock so as to command the entire area of the lot, about 100 ft. wide and 300 ft. long. The stored masts, booms, stifflegs, sills and long timbers are piled several tiers high on skids in the open air, and the hoisting engines, air compressors, boilers, dynamos and similar equipment are stored in an adjacent building, while ropes, tackles, fittings, connections, chains and miscellaneous supplies are stored in another building especially adapted to that purpose.

There are about eighty derricks of all sizes and varieties, including house or breast derricks and jinniwinks. The stiffleg derricks are of 1 to 20 tons capacity, and the guy derricks of 1 to 50 tons, the longest boom being 85 ft. All of the house derricks and jinniwinks are of wood, but a constantly increasing majority of the guy and stiffleg derricks are of steel.

Inspection and Care of Derricks

As soon as a wooden derrick is received all of the fittings are stripped from the wood, bolts removed and a very careful inspection made for breaks, cracks and other injuries or defects. All defective portions are replaced or repaired and the wood and metal thoroughly cleaned. The wood is oiled with raw linseed oil, over which there is applied a coat of hot coal tar. The iron and steel fittings are painted and bolted in place. The masts, booms, stifflegs and sills are protected by coverings of tarred paper tacked on over the upper surface and sides of each piece to exclude weather and moisture.

The erection of an ordinary steel building may occupy two or three months, during which period from 1000 to 2000 tons of materials are often hoisted by one main derrick, after which it is returned to storage, overhauled and sent out again when necessary. When maintained as above described in good condition and carefully handled it is expected to have a life of 6 or 8 years' actual working service. It is discarded before it shows signs of serious weakness.

Most of the steel derricks have sectional masts and booms with rectangular cross-sections made of four angles, with the flanges turned inward to offer as little projection as possible. In later models the flange angles are latticed with diagonal angles, riveted to their inner faces to give a stiffer member and one less likely to be injured. Steel derricks can be made much stronger than wooden ones and with proper care have an indefinite life. They do not, however, give warning when overloaded as do wooden derricks, and they are subject to bending and distortion from accident, blows and poor handling, as, for instance, when the flange angles in the boom and masts are frequently buckled or crimped by the careless application of hooks and links for handling them. Such injuries are watched for and promptly repaired when the derricks come to storage. When they are received they are dismantled and minutely examined throughout. The fittings are removed and examined, the condition of the sheaves and bearings is especially noted, all defective parts are repaired or replaced, the fittings reassembled in position and the derricks thoroughly painted.

Besides the ordinary derricks there are two two-boom mule travellers and one wooden tower traveller which are inspected, maintained and stored like the derricks. There is a 30-ton double-deck steel tower traveller adjustable to fit either 20 or 30 ft. gage track and a steel tripod tower adjustable to a height of 15 or 25 ft., which is intended for service in cellar excavations to form a pedestal for a 50-ton derrick.

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* From the Engineering Record.

Engines, Pneumatic Hammers and Timber

For the operation of the derricks and travellers there are 35 double-drum hoisting engines. A number of these have steam engines and boilers, chiefly of the Lidgerwood and Mundy types. About half of them are furnished with electric-driven gear, mostly of the Thomas and Lidgerwood types. On their arrival the engines and hoists are dismantled and thoroughly overhauled, particular attention being paid to alignment and bearings. The boilers are tested and all of the metal work is thoroughly oiled. There are three steam-driven duplex, two-stage Clayton air compressors, two steam-driven and two electrically driven Westinghouse compound air compressors, and one electrically driven Chicago Pneumatic Tool Company's air compressor. There are about 50 Chicago pneumatic hammers, a number of pneumatic holders-on, air and hand forges, reamers, and electric drills, besides a few 10 and 15-ton hydraulic jacks and a large number of screw-jacks with capacities up to 40 tons. All of these tools are carefully inspected and put in perfect repair as soon as received.

All derrick rigging consists of plow steel cable ⅝, ¾ and ⅞ in. in diameter for hoisting and topping lift tackles and up to 1⅜ in. in diameter for guys. The tackle ropes, up to 1000 or 1200 ft. long, are received on drums, from which they are unwound in the rope shed, where they are laid on the floor and every foot of their length is carefully examined for wear, injury or defects, and wherever suspicious is tested by bending sharply. Any badly worn, defective or suspicious portions are cut out and the ends spliced and the rope treated with Cablelene dressing and rewound on the drums. Manila ropes are used only for hand lines, tag lines and light service and for slings and tackles to handle very small members and for setting beams in place, for which service the slings are renewed every three or four weeks. Steel rope slings for the same service are expected to last through one ordinary building erection, a period of perhaps two or three months. One wire rope sling has a record of handling 5,000 tons of structural steel, after which it was still apparently in good condition, although condemned as a matter of safety.

Slings

Formerly most of the hitches for hoisting steel members were made with chains from 8 to 16 ft. long, with a ring at one end and a hook at the other end. The links were made of Swedish iron, ¾, ⅞, 1, and 1¼ in. in diameter, and they were considered when new to have safe working strengths of 9,000, 12,000 and 16,000 lb. each respectively. When returned to storage at the completion of a job they were very minutely inspected and any parts found defective were replaced or repaired, after which they were annealed, oiled, and hung up until issued for another contract. In very cold weather or when used for extra heavy loads they were annealed as often as every two or three months.

Notwithstanding the utmost precautions the chains were sometimes broken and considerable time and money were spent in an effort to find a satisfactory substitute for them. One device consisted of a chain with links about 4 in. long, made of ⅝ in. plow steel cable, spliced and served with annealed steel wire at both ends. A circular link served as a ring at one end of the chain and the other end was provided with an ordinary iron hook. These chains, although very strong, proved unsatisfactory on account of the stretch in the links, which were very much distorted and flattened under strain, although they resumed their normal shape when released, and on account of the difficulty experienced by the links catching on the points of the hooks.

The rope chains were, therefore, replaced by steel ropes ⅞ and 1 in. in diameter, 10 and 12 ft. long, which have a rated working strength of 18 and 28 tons each respectively. They are manufactured by the Roebling Sons Company, who fit each end of the rope into a coned clevis, one of which is connected to a ring and the other to a hook. These attachments are strong enough to break the body of the rope, and the slings are usually used for one job only—say during a period of about two months—after which the rope parts are scrapped. The most injurious stress that they are subjected to is believed to be at the sharp bend where the standing part takes bearing in the ring. The sling with a record of 5,000 tons of steel was of this type.

For girders and other heavy members the simple slings are replaced by bridles invented and patented by Mr. M. V. B. Ruland. Each bridle has a 3½ in. iron ring 1½ in. in diameter which is shackled to the hoisting tackle. To the rings are shackled through their clevises two 1 in. steel ropes 16 ft. long, with a hook at the other end. A double grommet about 10 in. long over all, made of ⅝ in. steel rope spliced over two iron thimbles, engages the 1 in. rope and slides freely up and down, receiving the hook in any position and slipping over the standing part of the rope until the bearing adjusts itself.

It is interesting to note that the ropes do not sustain any apparent injury by cutting or breaking over the sharp corners of the structural steel and that no cushions or packings are provided to relieve those bearings. The bridles and rope slings are considered very satisfactory, the principal objection being that after using they kink at short intervals, probably due to sharp bends and severe stresses. These kinks will straighten out under tension, but will reappear as soon as the tension is released.

For very heavy loads special slings are made of nineteen parts of ⅜ in. steel cables from 16 to 26 ft. long, attached at one end to a ring and at the other end to a hook. The different parts are thoroughly seized together with steel wire at intervals of 3 ft. and are parceled with canvas, renewed every time the slings are stored.

Guys

The steel guy ropes, about 100 to 150 ft. long, are examined, tested and dressed with Cablelene like the tackle ropes, and are coiled up on the vertical arms of skeleton reels, which are revolved by hand with a miter-geared crank. This winds them up so quickly that two or three times as many can be inspected in a day as was the case when they were coiled by hand. After being coiled they are wired together, lifted by an overhead differential hoist and stored on shelves along the walls. Each guy rope has a turnbuckle providing about 3 ft. adjustment and fitted at the upper end with a special clevis-like attachment made with two ½ or ⅜-in. steel plates riveted together, with space between them sufficient to receive the rope. At one end of the plates there is a 1½ in. bolt engaging the turnbuckle eye and at the other end a 1½ in. bolt receiving a cast iron sheave around which the end of guy rope is passed and clamped to the standing part. This arrangement is considered very reliable, efficient and satisfactory and eliminates the trouble previously caused by the guy ropes slipping over the head of the sheave and breaking the flanges of the latter or becoming wedged between it and the clevis.

In many cases the use of slings, bridles and chains is eliminated by providing a pair of angles shop riveted to the girders and columns and bored through their outstanding flanges to receive clevis pins by which they can be safely and expeditiously handled. After erection these angles are left in position if they do not interfere with the structural requirements or, if necessary, the outstanding flanges are scored on both sides near the root of the angle by a diamond-pointed chisel and easily broken off, leaving the other flange permanently shop-riveted to the member.

The lower ends of the plumbing turnbuckles have eyes engaging U-pieces, with the parallel ends shut close together and bent to form hooks suitable to engage an I-beam flange and offset about 45 deg. to correspond with the average inclination of the guys. Formerly these double hooks were made of round iron, but as these sometimes failed they are now made of $1\frac{1}{4}$ in. square iron, which has proved very strong and satisfactory. All hooks and clevises are annealed whenever they are returned to storage; the turnbuckles and screw ends are only occasionally annealed. Annealing is effected by heating to a cherry red in a gas furnace and allowing the pieces to remain and cool over night in the furnace after the gas is shut off. All forged connections are made of the best Swedish iron.

Miscellaneous Supplies

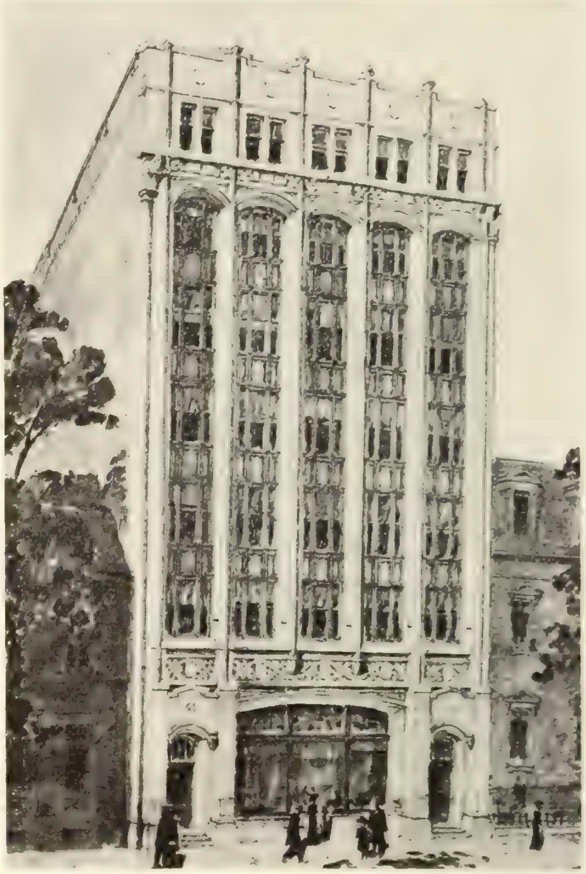
All tackles have steel blocks fitted with metalline bearings and a maximum of six 18-in. cast-steel sheaves, manufactured by the W. H. McWilliams & Sons Company. Wooden blocks are used for secondary purposes and with a maximum of four 12-in. sheaves for 2-in. Manila rope. Large wooden tool boxes filled with wrenches, bars, drifts, axes, saws and ordinary hand tools are kept packed ready to supply any job, and steam and air pipe, lanterns, water buckets and other miscellaneous supplies are kept in quantities and issued as required.

Complete records are kept of all the derricks, engines, air compressors, ropes and tackles, and other principal items of the plant. These show the different contracts for which they are used, their service there and the date when they are returned; what condition is disclosed by inspection, what repairs are made, and any other items of interest. The storage yard is provided with a shop equipped with forge and simple machine tools for ordinary repairs and renewals. The force consists of a dozen men, including a blacksmith, a carpenter, a machinist and a rigger, under the direction of Mr. M. V. B. Ruland and the general supervision of Mr. Aubrey Weymouth, chief engineer, and Mr. Frank McCord, engineer.

Cable street railways are still in use in the city of Edinburgh, Scotland. It is probable that this is the only city in the world where the cable system for ordinary street railway traffic, which was so extensively introduced twenty-five years ago, still remains in active service. It is recognized in Edinburgh, however, that extensions to the present cable system are not advisable. In view of the demand for new lines to suburbs the City Council of Edinburgh has appointed a committee to visit a number of English cities and examine various types of street railways. It should be understood that the Edinburgh street railways are owned and operated by the city.

New Montreal Building

Work has been commenced on a ten-storey office building on Beaver Hall Hill, Montreal, for the Guarantee Company of North America, from plans by Mr. Kenneth G. Rae, Montreal. The building is Gothic in design, and fireproof in construction. The foundations are to be of concrete, and the exterior granite up to the third floor, the remainder being built of terra cotta. A prominent feature will be the large amount of light provided for all the offices; the windows will be of metal. The interior is to be finished in oak, and the installation of two electric elevators will add to the convenience. The plan calls for steam heating and lighting by electricity. The contractors are the Geo. A. Fuller Company, Montreal.

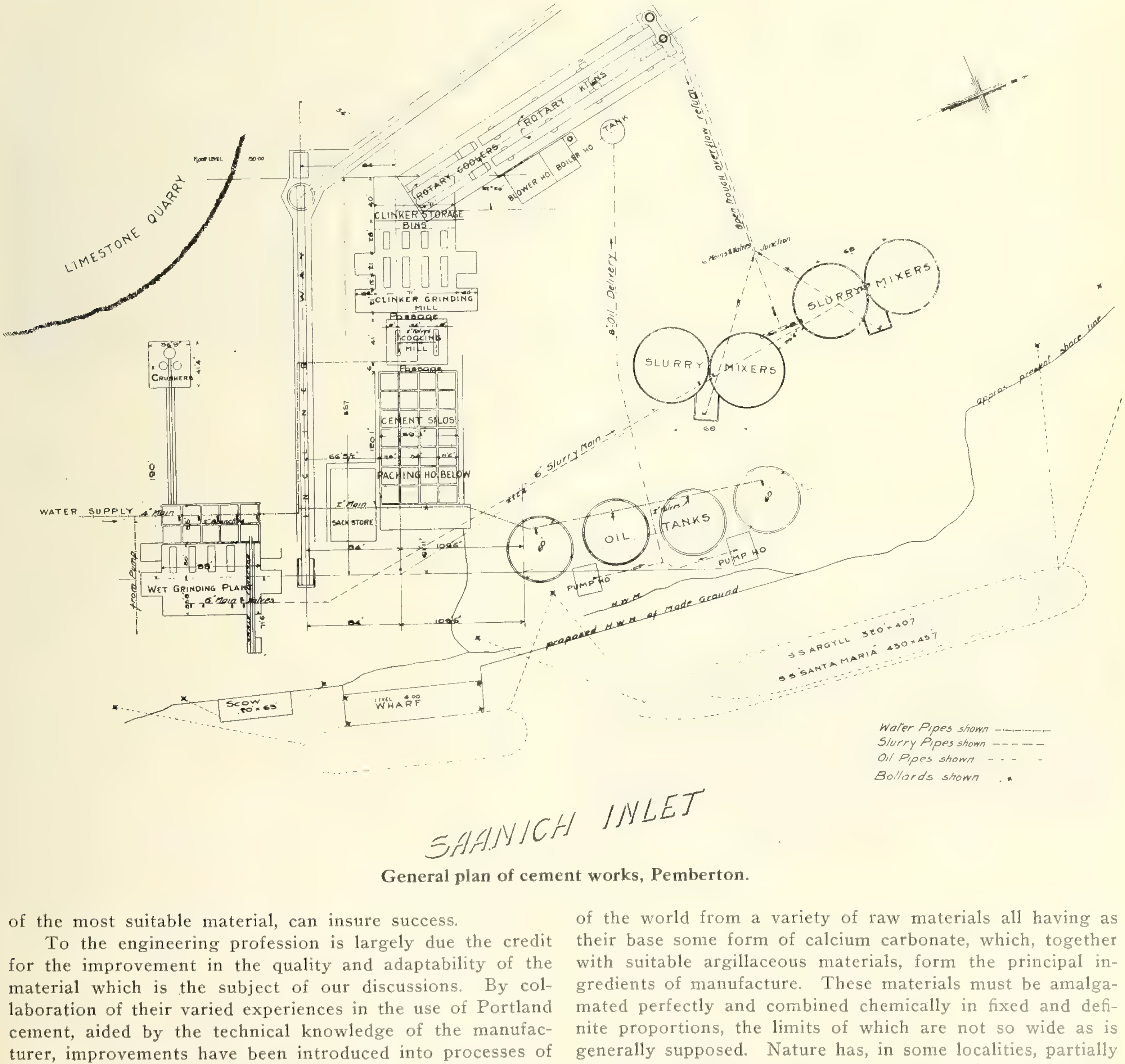


Proposed building for Guarantee Company of North America, Montreal.

In many cities of Europe various types of vacuum cleaners are being tried on the streets. Most of them are motor vehicles in which the motor operates the suction pumps and drives the car. In Milan a street sweeper similar to the ordinary carpet sweeper is being used. A revolving broom, 5 ft. wide and 4 ft. thick, revolves in an iron shell, which fits it closely except for the slot where the broom sweeps the pavement. The motor drives the broom round so fast that it creates a suction in the shell, sucking in dirt that is stirred up by the bristles. The dirt is then carried two-thirds of the way round the shell and thrown into a bin.

Modern Methods in the Manufacture of Portland Cement

THE subject matter of this address is one which has had the close attention of the engineering profession during recent years, because of the important functions which this material exercises in almost all constructional work. More especially is this the case where the engineer has to combat the mighty forces of nature, which are continually acting upon such constructions, notably in connection with hydraulic and marine work, such as docks, harbors, breakwaters, water reservoirs, etc., where the combination of forces is such that only the most skilful design, coupled with the use of the highest quality of the most suitable material, can insure success.



General plan of cement works, Pemberton.

To the engineering profession is largely due the credit for the improvement in the quality and adaptability of the material which is the subject of our discussions. By collaboration of their varied experiences in the use of Portland cement, aided by the technical knowledge of the manufacturer, improvements have been introduced into processes of making, which have wholly, or almost entirely removed the defects which existed in the early days of its production.

Specifications have been drafted as the result of the combined experience of engineers in all branches of the profession, which have gone far to raise the standard of quality, and to insure uniformity of this most important material of construction. The general principles governing the manufacture of Portland cement are well known to the profession. It will therefore be necessary to refer but briefly to the usual methods of manufacture, devoting the time at our disposal more particularly to those processes, upon the proper conduct of which, depends the ultimate quality and reliability of the material produced.

Portland cement is now being manufactured in all parts of the world from a variety of raw materials all having as their base some form of calcium carbonate, which, together with suitable argillaceous materials, form the principal ingredients of manufacture. These materials must be amalgamated perfectly and combined chemically in fixed and definite proportions, the limits of which are not so wide as is generally supposed. Nature has, in some localities, partially prepared and amalgamated these raw materials, but apparently without any preconceived ideas as to the use to which such material might ultimately be put, or the stringent requirements of engineers' specifications, with the result that in localities where such partially mixed materials are found, too much reliance is sometimes placed on these ancient natural operations. The cement manufactured therefrom usually has a reputation noted for the variety of its characteristics, and frequently contains one of the principal elements of failure, that is, want of uniformity. Unless such pseudo-natural raw materials are dealt with on scientific lines, it is preferable that they should exist in their elementary condition, having a fixed, definite and uniform chemical composition, such as pure calcium carbonate, the lime in which constitutes the base of the finished material, and clay or shales containing the acid constituents in correct ratio. Given modern machinery for the proper proportioning, amalgamating, and calcining of such substances, and the subsequent reduction, to a fine powder of the resulting clinkers, a more uniform product can be obtained than by the use of semi-natural materials, where too much reliance is placed upon the reducing and mixing effects of ancient geological operations.

The manufacture of Portland cement had its origin in Great Britain, where suitable raw products are found in the greatest abundance. The advancement of chemical science, however, has enabled materials of different characteristics found in various parts of the world to be brought into use, and the author himself has been engaged on the construction of a cement plant, at Bamberton, on the Saanich Inlet, Vancouver Island, for the Associated Cement Company, Canada, Limited. This company was formed by the Associated Portland Cement Manufacturers (1900) Limited, of England, to operate upon a practically pure limestone and a clay shale of very uniform composition. With these materials and with the aid of the modern plant which has been installed, it is confidently expected that cement will be produced of a quality equal, if not superior, to the cement imported from the United Kingdom. The utmost importance is being placed on the great desideratum of all engineers, uniformity of quality.

While describing the general methods of manufacture usually adopted, particular reference will be made to the special processes which have been introduced in the new plant on Saanich Inlet, in order to insure the absolute uniformity of quality, the absence of which in the product of many plants has been the cause of much anxiety and trouble to the constructional engineer.

Rotary kiln and rotary cooler

Atmospheric Influences on Cement

There are many factors which help to produce various unsatisfactory results, but perhaps the feature of the most prominence in the experience of the engineer, and the one in which uniformity is most desirable, is that of setting time. The difficulties are great, if during the construction of some important work one is suddenly confronted by a change in the characteristics of the material he is using, to counteract which might necessitate a reconsideration of his methods of construction. It should be the aim of all cement manufacturers to supply as uniform a material as possible, so regulating the various properties of their product to suit the climatic and other existing conditions which have a most important bearing on the setting time of all cement. As a chemical product cement is rapidly affected by changes in atmosphere. The difficulties which confront a maker of cement who has produced an article, the very first quality of which is subject to variation in many of its characteristics from atmospheric changes, are neither fully realized nor understood; and it frequently happens when some difficulty due to these causes arise in connection with construction, the quality of the cement is unjustly impugned. Long experience has taught the prudent manufacturer how to produce cement which is least affected by such changes, and the methods adopted will be shortly described.

The Processes of Manufacture

The manufacture of Portland cement necessitates three distinct and separate operations. The first process is mechanical, and includes assembling, proportioning, amalgamating, and the grinding of the raw materials. The second is a chemical process during which the materials prepared by the first are calcined at a high temperature, thus bringing about chemical combination of the various ingredients. The third and final operation is partly mechanical and partly chemical. Through this the clinker resulting from calcining, together with small percentage of retarder, is reduced to a fine powder. During the latter operation the cement is submitted to a partial process of hydration by means of steam, at a temperature ranging between 220 and 300 Fahr., and after subsequent cooling the cement is ready for immediate use.

First Steps in the Process

It is essential that the raw materials selected are of such physical character as to be of easy reduction, and such chemical composition that the resulting mixture contains the necessary ingredients in proper ratio one to the other. If so constituted, and thus available for the purpose, the proportions of the mixture are kept constant by means of continuous chemical supervision, the permissable limits of variation in the composition of raw mixture being very narrow. This preliminary part of the manufacture may be conducted by one of three methods, depending upon the physical condition of the raw material to be operated upon.

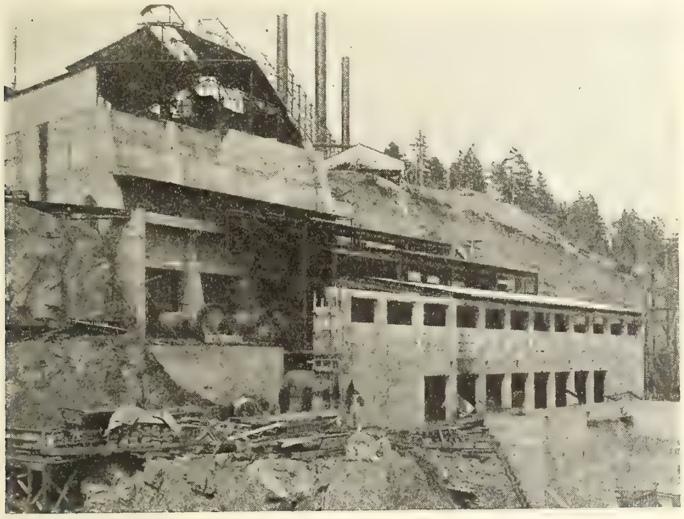
(1) Where the materials are soft, as in the case of chalk, clay and marls, such as are found in England, the wet process is usually adopted, which consists of reducing the materials together to a pulp, or slurry, containing about 40 per cent. water. This is easily accomplished in open wash mills, requiring but small expenditure of power.

(2) When one or both of the materials are of a hard or crystalline character, and in some cases with the soft materials already referred to, the dry process is adopted, which consists of evaporating the water from the raw materials as quarried, and grinding them in a dry state to a fine powder, by means of suitable machinery.

(3) The third process, which is suitable for both soft and refractory materials, has been adopted for the works at Bamberton, and consists of a semi-wet process, in which the drying of the raw materials is avoided, the materials being reduced to a thick slurry in mills suitable also for the dry process, but with a small percentage of water, producing a more uniform and reliable product than is possible with the dry process.

In any of the processes it is essential to reduce the raw material to such fineness that at least 95 per cent. will pass through a sieve having 32,400 holes per sq. in., more particularly where the materials have not been partially mixed by nature.

A great improvement in the quality of the cement is produced by the introduction, at this stage of the manufacture, of such storage capacity and machinery that large quantities of this prepared slurry can be kept in reserve, and continuously mixed, thus correcting any irregularities that may have occurred in the composition of the material during the first mixing and grinding operations. By this means, a product of absolutely correct and uniform composition is presented to the kiln for calcination. It will be readily understood that, although the cement industry as a whole has not until recently thought it necessary to provide such intermediate storage of prepared raw material, it is a matter of great importance before the material is submitted to an expensive chemical process of calcination, in which the desired results are so adversely affected by any irregularity either in the material, or the temperature at which the operation is conducted, that this correcting process should be installed. It is not possible to get perfect chemical combination of the lime and the silicates and aluminates of the clay or shale, unless the materials have been reduced to a very fine state of subdivision, and have been thoroughly amalgamated.



Grinding and cooling mills

The Second or Chemical Process

The calcining or clinkering is carried out in rotary kilns, which with modern practice are increasing in size, now averaging from 150 to 200 feet in length, and from 7 to 10 feet in diameter, being set at an angle to the horizontal of ½ in. to the foot. The raw material is fed into the upper end of the revolving kilns, while the fuel for raising the temperature within the kiln is introduced at the lower end, the raw material passing successively through the three operations of drying, calcining, and clinkering, on its passage down the kiln, the clinker leaving the kiln at red heat. This heat is removed by passing it through rotary coolers, and is used for heating the air for combustion passing into the kiln.

The cool clinker is now ready for the final grinding operation, but before being submitted to this the clinker is stored and mixed under cover in large bulk, so that once more, any small irregularities of the calcining operations are spread over the product of several days, and thus tend towards uniformity of the finished product.

The Third or Grinding Process

After cooling and mixing, the clinker, which is of a hard and refractory character, is reduced to a fine powder with the aid of very powerful crushing and grinding machinery. The importance of very fine grinding was not realized until recent years, but its value will be understood when it is known that it is only the impalpable powder of the cement which has any cementitious properties, the coarser particles present being of no more value than their equivalent bulk of sand or crushed rock. It is common practice at the present time to so reduce the clinker that 85 per cent. will pass through a sieve having 32,400 holes per square inch, but at the new works at Bamberton, machinery has been installed to enable the cement to be so ground that 95 per cent. will pass through this sieve if required. This extra fineness materially increases the cost of production, but adds considerably to the cement value of the material. Using this fine ground product a much richer and stronger concrete is obtained, by reason of the larger quantity of cementitious material present in the finely ground article and in addition economies in the cost of construction can be obtained by reason of the larger amount of aggregate which such fine ground cement will carry, to produce equal results.

During the process of grinding, provision is made for the regulation of the setting time of the cement. Clinker ground without any such provision always sets very quickly. The method adopted at the Bamberton works is similar to that now almost universally employed in England, and consists of injecting steam into the tube mills during the final process of grinding, together with the addition of a much reduced proportion of gypsum, which is used as a retarder. The effect of this process is to hydrate and thus remove the expansive properties of any loosely combined lime compounds which have passed the earlier processes uncorrected, and thus produce a cement which is safe to use immediately after manufacture, even if taken hot from the mill. By means of this process the setting time of cement can be regulated to suit all requirements.

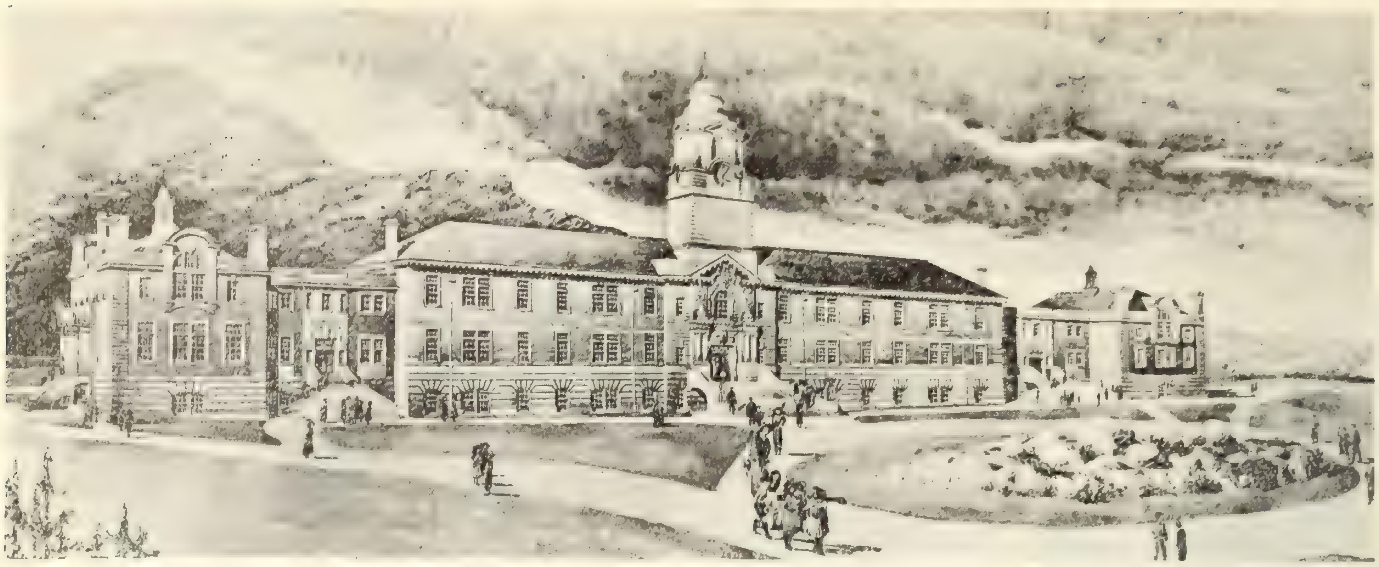
Improvements in Making

The difficulty often experienced by engineers, however, in using hot cement is being provided against by the introduction, at the Bamberton works, of a separate cooling plant, through which all cement as it leaves the grinding mill is passed. This special plant extracts the heat from the cement, reducing it to atmospheric temperature before storage. This is a very important addition to the methods of modern manufacture, and, although used largely in English plants, is being introduced for the first time into Canada. Indeed, this is the first installation of the kind on the American continent. After the cement has been submitted to the process described, it is stored and mixed in large bulk at atmospheric temperature, before being placed on the market, and it is hoped that the provision which has been made at the new works to produce cement of an absolutely uniform quality will be appreciated by engineers and contractors throughout the province of British Columbia.

The works at Bamberton are now just commencing manufacturing operations, and will be producing the full output of 2,000 barrels per day by the end of June. The plant was designed by the Associated Cement Company's own staff, and practically the whole of the machinery was manufactured in England.

The work of construction was entrusted to Messrs. McAlpine, Robertson & Company, of Vancouver, under the supervision of the Associate Company's resident engineer's staff and the power for the plant is supplied by the British Columbia Electric Railway Company.

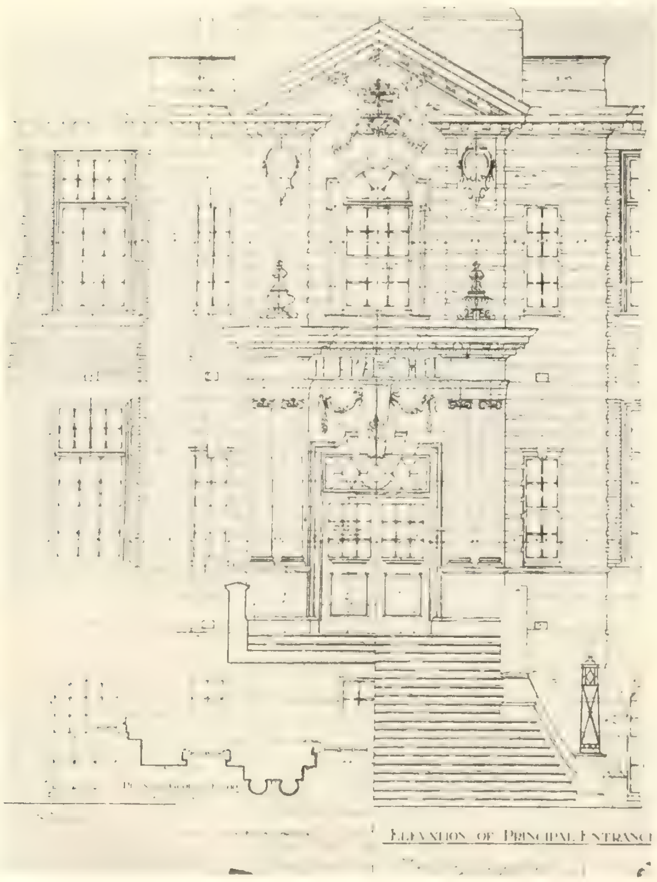
Street accidents in London, England, cost the lives of 538 persons and injuries to 16,651 more in the year 1912, according to statistics issued by the British Home Office. The greatest number of fatal accidents from any one class of street traffic was 182 deaths caused by motor omnibuses; electric cars caused 37 deaths; motor vehicles, 171; horse-drawn vehicles, 143, and horse-drawn omnibuses, 5. More than half the nonfatal accidents were due to motor omnibuses and other motor vehicles.



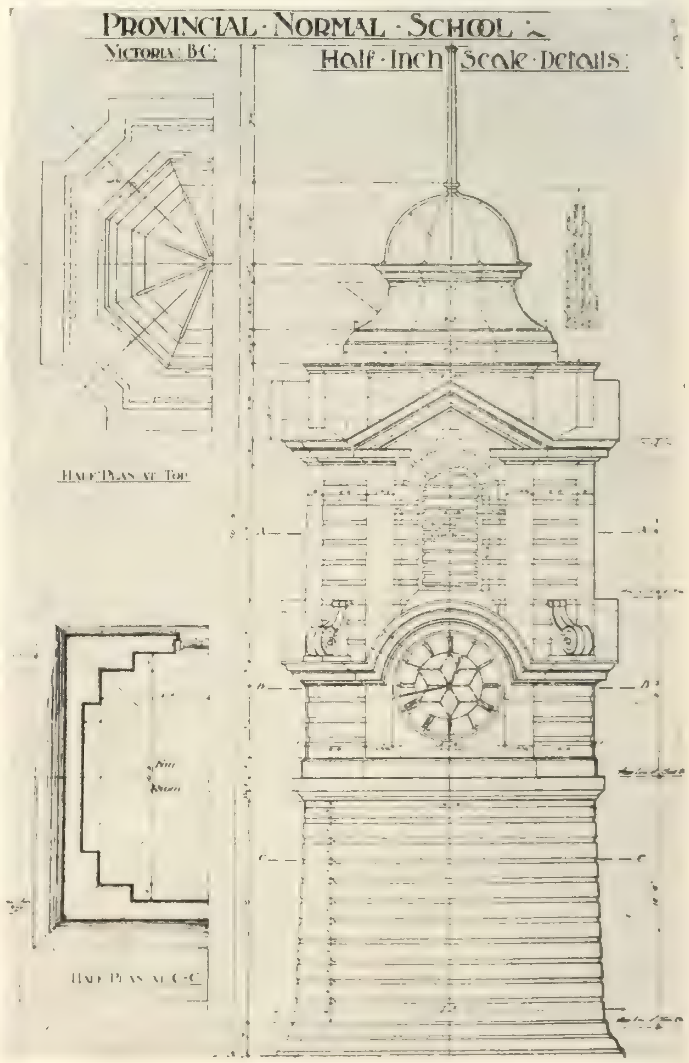
Normal School at Victoria, B. C.

THE general contract for erecting the proposed Provincial Normal School Building at Victoria was recently awarded by the Department of Public Works to Luney Bros., of Victoria, the contract price aggregating $300,000. The extreme exterior dimensions of the building are 76 x 313 feet, the construction is to be thoroughly fireproof, of reinforced concrete, red pressed brick, and terra cotta with slate roof. A central tower, 95 feet in height, is one of the features of the design. The main entrance to the building will be finished in terrazzo tile. The interior of the auditorium is carried out in plaster decorations. The specifications call for a complete fire protection system.

Included in the equipment will be a system of low-pressure steam heat; exhaust ventilation; vacuum cleaning plant;



Elevation of principal entrance.



Elevation of tower

gas plant; wood block floors throughout; automatic temperature control; electric time system; inter-communication telephone system; and a full equipment for the various rooms and departments on the different floors.

On the lower floor will be a gymnasium, 73 x 35 feet, recreation rooms, heating and fuel chambers, store rooms, lavatories, bath and dressing rooms, and plunge and shower baths for both sexes, luncheon rooms, manual training; masters' rooms, cycle rooms; games and storage rooms, janitor's rooms.

An auditorium, 73 x 35 feet, with gallery, platform, anterooms, etc., four students' class rooms, etc., three model scholars' class rooms, principal's and teachers' rooms, two music rooms, secretary's office, cloak and locker rooms, library, store and stock rooms, lavatories, etc., will occupy the ground floor.

On the first floor will be situated four class rooms, clay modelling, art, science, lecture and preparation rooms, optical dark room, biological, chemical and physical laboratories, balance and stores rooms, science master and assistant science masters' rooms, lavatories, etc.

A feature on this floor will be a section devoted to the study of domestic science, including lecture room, a laundry, dressmaking and sewing rooms, cookery department, and a complete living suite, with two bedrooms, dining-room, etc On the first floor will also be rest and sick rooms, a room for medical stores, etc.

An ideal site for the location of the school has been chosen on a 7-acre tract at the corner of Richmond and Lansdowne Roads. Mr. W. C. F. Gillam, of Vancouver and Victoria, is the architect.

Canadian Boving Company

The business of The Canadian Boving Company is now being operated under the title of Boving & Company of Canada, Limited, in order to bring the style into line with that of the other branches of Boving & Company, Limited, London, which are operating in Japan, New Zealand, Brazil, Mexico, etc. Owing also to the grent increase in the volume of business and to their having purchased the works of the Madison Williams Manufacturing Company of Lindsay, Ontario, the capital of the Company has been increased to $1,000,000, a portion of the first issue having been found in Canada.

The company is now in a position to turn out in their Canadian works the following machinery, water turbines, centrifugal pumps, pulp and paper making machinery and sawmill machinery. Previously, centrifugal pumps had been made in England, and the water turbines, pulp making and paper making machinery in Sweden, while the sawmill machinery has been manufactured by the Madison Williams Company in Lindsay.

The Canadian Boving Company, Limited, completed their first large plant in Canada in 1910, viz., water turbines of some 8,000 h.p. for The Calgary Power Company and among other important contracts which have since been executed are:—City of Winnipeg—5 double horizontal open flume Francis turbines, 29,000 h.p.; 2 double horizontal enclosed Francis turbines (exciters), 900 h.p. The Sydney Power Company, Trenton, Ont.—4 double vertical open flume Francis turbines, 6,000 h.p.; 6 double vertical open flume Francis turbines, 4,800 h.p. Ocean Falls Pulp Company—6 single horizontal enclosed Francis turbines, 10,800 h.p.

Centrifugal Pump Contracts

City of Toronto—4 pumps 54,000,000 gals. capacity per 24 hours, 250 ft. head; 4 pumps 40,000,000 gals. capacity per 24 hours, head 100 ft. Montreal Water & Power Company —3 pumps, 31,000,000 gals. capacity per 24 hours, 440 ft. head. City of Moose Jaw—2 pumps, 1,700,000 capacity per 24 hours, head 69 ft.; 2 pumps, 1,700,000 gals. capacity per 24 hours, head 120 ft. They have also installed a considerable amount of pulp making machinery.

The experience gained during the past three years by The Canadian Boving Company has enabled them to gauge the Canadian market, and to familiarize themselves with its requirements to give accurate estimates as to the cost of manufacture. The firm is working in close alliance with Boving & Company, Limited, Union Court, Old Broad street, London, England, to whose designs their machinery will be manufactured with such modifications as may be necessary to suit Canadian needs.

The existing works are quite up-to-date, having been built in 1906. Large additions, however, will be made to them imediately so that in twelve months time the capacity of the works will be about four times that of the present shops, and a number of new and up-to-date machine tools will be added so as to ensure the accurate workmanship now required for modern machinery.

Canadian Railroad Development

The Canadian Northern Railway is stated to have made an agreement with the city of St. Catharines to carry the proposed line from Toronto to Buffalo through that city on consideration of the payment of a bonus of $100,000. It is stated that the entire line is promised complete and in operation in three years.

Work will probably be started next month on the harbor improvements and building of grain elevators at Port Nelson, which is to be the terminus of the Hudson Bay Railway. About $5,000,000 will be expended for these improvements. Frank Cochrane, Ottawa, Ont., is Minister of Railways and Canals.

The mountain section of the Grand Trunk Pacific Railway will be completed, and the whole line from Winnipeg to the coast ready for operation in August of next year, according to Mr. Collingwood Schreiber, C.M.G., the chief consulting engineer of the railway department, who has just returned from an inspection of the line.

The railhead of the Canadian Northern Railway from the west has reached Anderson Creek, which is as far as it can go until a steel bridge over the creek is completed. Work on this structure, which is to be an eleven-span viaduct 1,000 feet long, was begun only a short time ago. As soon as they cross Anderson Creek, the track layers will have a clear fifteen miles of completed grade ahead of them.

The Grand Trunk Railway Company will hold a special meeting at Montreal on July 16 for the purpose of passing a by-law authorizing the issue of debentures for $15,000,000 under the provisions of the act passed by Parliament recently, by which the Government is to loan that amount to the company. The debentures, when issued, will be delivered to the Dominion Government, and they will be guaranteed as to principal and interest by the Grand Trunk Railway.

Plans are being prepared for the new Dominion Government buildings and Union passenger station to be built between Yonge and York streets, Toronto. It is proposed to widen both Front and Yonge streets to provide ample approach to the new Customs and station buildings. The Customs-house and examining warehouse will occupy the block from Yonge to Bay streets, and the station will be built on the block between Bay and York. A large station distributing post office will be placed on the York street corner of the station block. Yonge street south of Front will be widened to 100 feet and Front will be widened from 88 to 105 feet between Yonge and York. This means the removal of the present Customs building. They will be replaced by a handsome seven-storey building, the estimated cost of which will be between a million and a half and two millions. The Union Station, plans for which are being completed, will cost probably two millions.

The recent opening of the new C. P. R. Wilkie-Kerrobert line means a reduction of railroad mileage to points from Saskatoon in the Kerrobert district, and consequently a reduction of freight rates. Prior to the opening of the line, shipments destined for Kerrobert and points adjacent had to be conveyed from Saskatoon to Macklin via Wilkie and thence to destination, which is approximately 209 miles. By the new route the distance is reduced to 144, or a saving of 65 miles.

According to information from the west, the C. P. R. has elaborate plans in regard to the depot accommodation for Calgary. The new C. P. R. hotel is progressing favorably, and will be opened towards the end of the summer months. When the double-tracking of the road is finished into Calgary, an additional exit and waiting room will be erected on the south side opposite the present station, and the entire tracks will be covered with a large roof in practically the same manner as the new train shed at Montreal. The approximate cost of the added facilities and improvements will, it is stated, be about half a million dollars.

Mainly Constructional

The News in Brief—From Coast to Coast

R. McLean & Company have been awarded the contracts for laying sewers in various districts near Kerrisdale, B.C., for a total sum of $501,855.35, if paid in cash, and $516,911.06 if paid by treasury certificates.

The Dominion Government has purchased a harbor at Port Credit, Ontario, for $30,000. For years this harbor has been little used, but it is now possible that it will be dredged and put into a proper state of repair.

The Milton Pressed Brick Company, Limited, Milton, Ont., have recently increased their capital from $250,000 to $1,000,000. The new stock is in the form of 7,500 shares of $100 each, of which 4,000 are preference and 3,500 common.

The Westholme Lumber Company, who were the original contractors on the Sooke Lake Waterworks scheme, have entered a law suit against the city of Victoria and various officials, alleging misrepresentation and deformation of character.

A contract involving about $175,000 has just been let by the Canadian Swift Company for the erection of its proposed new branch house for Victoria. The structure will be three storeys high and of reinforced concrete. The building is to be finished early next year.

The board of works of South Vancouver has approved of an estimated expenditure of over $87,000 on plank walks and roads, clearing and grading, construction of box culverts, racking, etc. They also appointed Mr. Peter Wylie to act as street superintendent of the engineering department at a salary of $225 per month.

The Cowichan Lake branch of the E. & N. Railway on Vancouver Island, a subsidiary of the C. P. R., will be opened in a few days. Since the completion of this branch preparations have been made for extensive exploitation of the district's timber resources, and a camp has been established near the lake. It is expected that within a month logs will be available to keep thirty to forty cars moving every day.

With the letting of a contract to the Canadian Pipe Company, Limited, for the supply of wood-stave pipe at a cost of approximately $20,000, the early completion of the waterworks system which the Sooke Harbor Water Company, Limited, will instal at Sooke Harbor, is assured. The plans of the system are now in the hands of the Government, and as soon as they are approved the work will be rushed, and will, it is expected, be completed within two or three months.

With the new main at present being completed for the supply of the Mount Pleasant district, of St. John, N.B., a sufficient amount of water for all modern requirements will be available there at a height of at least 250 feet above the sea level. This would mean that the present gravity system would carry the water to this height, and fourteen storey buildings in the business section will not find it necessary to install pumping systems in order to have water in abundance, even on the roof.

Marked progress is being made in the extensive project of grade separation and elimination of level crossings of the Canadian Pacific and Canadian Northern Railways at North Toronto. The viaduct grade has been reached from Yonge street to Avenue road, while the operations between Summerhill avenue and Dufferin street are being pushed forward without interruption. While the appeal of the city to the Governor-General-in-Council against the order of the Dominion Railway Board fixing the height of the subway at twelve instead of fourteen feet, is pending the work in the immediate vicinity is advancing rapidly.

Announcement of a Royal Commission to report on the provincial roads system may be expected from the Ontario Provincial Government at an early date. The Commission is expected to consist of three members, Mr. C. A. Magrath, who is a member of the Canadian section of the International Waterways Commission, and is a former M.P. for Alberta, is stated as one of the three, and will probably act as chairman. Mr. W. A. McLean, chief engineer of the highways branch of the Department of Public Works, and who is at present representing Ontario at the International Good Roads Congress in London, England, will be another member. The third will probably be a member of the Legislature.

Personal Mention

Mr. James Goodfellow Mann, who was one of the pioneer contractors of Victoria, died in that city on June 17.

Mr. P. E. Jarman has been appointed acting chief engineer of the City of Westmount, P.Q., until 31st October, the end of the fiscal year. Mr. Jarman was assistant to Mr. Archibald Currie, who is now city engineer of Ottawa.

Street Commissioner Wilson and Dr. Hastings, M.O.H. for Toronto, have recently returned from a trip of investigation of the garbage disposal and incineration plant systems of several United States cities. They are both strongly in favor of municipal ownership.

Mr. Alexander Cox, one of the chief engineers of the Peking-Tientsin Railway of North China, arrived recently in Victoria from the Orient. Mr. Cox was one of the original constructors of the railway which connects Peking with Tientsin, and is a prominent official in the Anglo-Chinese railway systems. He is making personal observations of the systems of the Canadian railways.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Waterworks, Sewerage and Roadways

Brampton, Ont.
Pavements planned by Town Council. Clerk, W. H. McFadden. Engineer, Wm. Treadgold. Queen street, vitrified brick, $4,389; Main street, asphalt block, $17,526; Queen street, Dolarway, $14,837. By-law passed.

Dundas, Ont.
Town Council plan to purchase drainage tiles. Chairman Board of Works, A. B. Wilson. Clerk, J. S. Fry.

Elma Twp., Ont.
Drains. Council will have plans prepared for a number of new drains and also repairs to others. Clerk, Geo. Lochhead, Atwood, Ont.

Montreal, Que.
Park Improvements, cost $20,000, St. Helen's Island, for Board of Commissioners. Secretary, L. N. Senacal. $20,000 voted for water supply, etc.; $500 for water; $7,500 for 3 kiosks; $6,000 for 4 double lavatories; $1,500 for repair to roadways.

Board of Control asked for vote of $34,500 to pave Champ de Mars. Sec., L. N. Senecal.

Mosa Twp., Ont.
Drain repairs, for Twp. Council. Clerk, C. E. MacNaughton, Newbury, Ont. Repairs to drains Nos. 7, 3 and 4 and drain No. 1 to be completed.

Preston, Ont.
Sewers and pavements on a number of streets, planned by Town Council. Clerk, H. C. Edgar.

Petrolia, Ont.
Tenders received by Clerk, J. McHattie, until July 7th for construction of sewers on several streets. Plans and specifications at office of Clerk.

Toronto, Ont.
Trunk sewer, cost $4,000,000, North Toronto and Moore Park, contemplated by the Board of Control. Mayor H. C. Hocken, City Hall. Commissioner of Works, R. C. Harris, Will take three years to complete, septic tanks recommended in the meantime.

Tile pipe sewers, cost $11,410, for Board of Control. Mayor, H. C. Hocken, City Hall. Commissioner of Works, R. C. Harris. Commissioner recommends sewers on number of lanes.

Virden, Man.
Roads, cost $25,000, for Municipality of Wallace. By-law passed for good roads and highway improvement.

Victoria, B.C.
Concrete conduit, for city council. Water Commissioner, C. H. Rust. Tenders received at office till noon July 15th, for the fabrication and laying of 27½ miles of reinforced concrete pipe and apparatus on the line of the Sooke Water Supply Conduit. Plans, specifications, etc., at office of Sooke Water Supply, 1414 Douglas street.

Woodstock, Ont.
Sewers. Clerk, Jno. Morrison. Chairman Board of Works, Jas. Mitchell. City Engineer, F. J. Ure. Plans, etc., at office of Engineer. Tenders received by Chairman until July 10th.

CONTRACTS AWARDED

Brampton, Ont.
Concrete pavement and curb, planned by Town Council. Clerk, W. H. McFadden. Engineer, Wm. Treadgold. General contractors, Curran & Clement. $1.40 per yd. for pavement, and 38c for curb.

Dunnville, Ont.
Watermains, cost $3,100. Supt. Waterworks Commissioners, Robt. G. Kyd. General contractor, W. H. Cockman, Niagara Falls, N.Y.

Dunwich Twp., Ont.
Tile drains planned by Twp. Council. General contractor, F. O. Canfield, St. Marys, Ont. Contract for supplying twelve carloads of 16 in. tile.

Twp. of Enniskillen, Ont.
Drains, Lewis and Bradley streets. Clerk, Geo. V. Wyant, Petrolia. General contractors, Davidson & Brownscombe, Petrolia, P.O., and James Barr, Petrolia, P.O.

Hull, Que.
Sewer, cost $4,000, Church street. Mayor, Mr. Dupuis. Engineer, J. A. Laforest. General contractors, International Construction & Supply Company.

Listowel, Ont.
Cement walks planned. Mayor, Wm. Climie. General contractor, S. Alberts, Listowel. 12½c sq. ft.

Montreal, Que.
Watermains, Pointe Claire. Engineer, V. H. Dupont, 225 St. James St., Montreal. General contractors, Laurin & Leitch, 5 Beaver Hall square, Montreal. Pig lead, pipe and fittings, Garth Company, 28 Craig street west, Montreal.

Sewerage system, Pointe Claire. Engineer, V. H. Dupont, 225 St. James st., Montreal. General contractors, Laurin & Leitch, 5 Beaver Hall square, Montreal. Tile pipe, Alex. Bremner, 100 Bleury street, Montreal.

New Hamburg, Ont.
Pavements. Clerk, David Eby. General contractors, Royal Artificial Stone Paving Co., Guelph.

Osborne, Ont.
Tile drains planned by council. General contractors, Copeland Bros., Woodham, Ont.

St. John, N.B.
Sewerage system planned by County Council. Chairman Sewerage Board, Wm. Golding, 58 Harding st., Fairville. Pipe, Jas. Robertson Co., Ltd., 1 Sheffield street. Work, Murray Long, 241 Prince St. W.E. Engineer, G. G. Murdock, 74 Carmarthen street.

St. Martin, Que.
Macadam roadways, cost $160,000. Laval Co., planned by Town Council. Sec.-Treas., Nap Mallette. General contractor, William Plouffe.

Winnipeg, Man.
Contracts awarded to E. F. Campbell, Supt. of Asphalt plant No. 2 pavement for sewer in Merrion ave. from Helen to Berwick St., at $1,089.05. Secretary, M. Peterson.

Watermain for Board of Control. Sec., M. Peterson. Engineer, H. N. Ruttan, 223 James Ave. Contract awarded to J. W. Astley, Engineer of Construction City Yards, for watermain on Wall St. from Portage to Wolever Ave., at $526.50.

Granolithic walk, on east side of King street, Jarvis street to Dufferin. Contract awarded to J. W. Astley, Engineer of Construction, City Yards.

Sewers, Stainer, Battery and Nassau streets. Engineer, H. N. Ruttan, 223 James Ave. Contract awarded to Henry Martin, 620 Redwood Ave. Sec., M. Peterson, Board of Control.

Sewers, in Alfred Ave., Shaughnessy St., St. Nichol St. and Brazier St. Contractor, J. W. Astley, Engineer of Construction, City Yards. Sec., M. Peterson, Board of Control.

Asphalt and flux. Engineer, H. N. Ruttan, 223 James Ave. Contract divided equally between Alloway & Champion, 362 Main st., and Can. Mineral Rubber Co., Canada Bldg., for supply of refined asphalt and contract awarded to Union Oil Co., of California. Chicago, for fluxing oil at $20 per ton. Sec., M. Peterson, Board of Control.

Windsor, Ont.
Pavements, cost $9,850, Langlois. City Engineer, Edw. Brian. General contractors, Benjamin Oldani & Co. Reinforced concrete, 5,000 sq. yds.

Railroads, Bridges and Wharves

Berlin, Ont.
Grand Trunk Railway Company has been authorized to construct siding and spur therefrom for the Dom. Tire Co., Ltd. (Canadian Consolidated Rubber Co.

Decker, Man.
C. N. Ry. Co. has been directed to erect 3rd class station at Decker, Man., and construct two car cattle pen. Work to be completed by Sept. 15th.

Elmsley Station, Ont.
C. P. Rly. Co., has been authorized to construct bridge No. 312 near Elmsley Station, Havelock Sub-Div., Ontario Div., Ont.

Foster Station, Que.
C. P. Rly. Co. has been authorized to

construct bridge No. 103.7, near Foster Station, on Sherbrooke Sub-Div., Eastern Div., Que.

Kingston, Ont.

G. T. Rly. Co. has been authorized to construct siding for A. Davis & Son, Limited.

Kingston, N.S.

Dom. Atlantic Rly. Co. has been authorized to construct siding for Markland Fruit Co., Ltd., at Kingston, Kings County, N.S.

Levis, Que.

Dredging. Tenders received by Sec., P. E. Ryan, Ottawa, Ont., Commissioners of Transcontinental Railway, until July 3rd. Plans, etc., at office of Mr. Gordon Grant, Chief Engineer, Ottawa, and A. E. Doucet, Dist. Engineer, Quebec City.

Car ferry slip. Tenders received by Sec., P. E. Ryan, Ottawa, Ont., Commissioners of Transcontinental Railway, until July 3rd. Plans, etc., at office of Mr. Gordon Grant, Chief Engineer, Ottawa, and A. E. Doucet, Dist. Engineer, Quebec City.

Little Current, Ont.

Algoma Eastern Rly. Co. has been authorized to construct Goat Island Coal Handling Bridge, on Goat Island Dock, near Little Current, Ont.

Prov. of Quebec

Bridge, cost $8,800, over White River, for Municipal Council of St. Andre d'Acton. Plans and specifications at office of Sec.-Treas., J. S. Beaudet. One span, 150 x 17, concrete, steel and 4 in. red pine. Beurrerie Provost bridge.

Stratford, Ont.

Bridge, cost $2,400, Romeo, planned. Mayor, C. N. Greenwood. Chairman of Board of Works, Ald. Pauli. City Engineer, A. B. Manson, City Hall. One span 60 ft. long and 14 ft. wide, concrete and steel. Plans, specifications, etc., may be seen at Engineer's office. Surveys have been made.

Thorold, Ont.

G. T. Rly. Co. has been authorized to construct spur into premises of Pilkington Bros., Limited, on Lots 71 and 72, Twp. Thorold Co., Welland, Ont.

Toronto, Ont.

Parks Commissioner Chambers contemplates dredging and making improvements to Cat Fish Pond in High Park, estimated cost $30,000. Mayor H. C. Hocken, City Hall.

Viaduct, etc., cost $13,000,000, The Board of Control have approved of the agreement between the city representatives, Harbor Commission, G. T. R. and C. P. R. The viaduct will take the form of an earth embankment from Cherry street to Yonge street, 500 feet south of the present esplanade. Earth embankment with concrete retaining wall, west of Yonge street, right-of-way 230 ft. 8 to 12 tracks. Subways of concrete construction to be provided. Windmill line to be extended 1,030 ft. south, will allow for new wharves and dock to cost about $5,000,000. A new waterfront street 130 ft. wide south of the viaduct will extend from Cherry street to Bathurst street to connect with the proposed boulevard drive. The Union Station will be built south of Front street between Bay and York. The new Customs House between Yonge and Bay, Both Yonge and Front streets will be considerably widened.

C. P. Ry. Co. has been authorized to construct 2 additional sidings into premises of C. A. Scott, on part lot 2 south of Carlaw Ave.

Vancouver Island, B.C.

Esquimalt & Nanaimo Rly. Co. has been authorized to construct Bridge No. 27.8 over Coal Creek, on Comox extension, Dist. Newcastle, Vancouver Island, B.C.

Winnipeg, Man.

Canadian Northern Railway Company has been authorized to construct spur for Manitoba Gypsum Co., Ltd., through Lot 20, R. L. 41 and Lot 4, R. L. 42. To be completed by September 17th, 1913.

CONTRACTS AWARDED

Brampton, Ont.

Bridge, cost $2,415. Clerk, W. H. McFadden. Engineer, Wm. Treadgold. General contractor, Patterson. Concrete arch.

Belleville, Ont.

Dredging and wharf, cost $116,000. Dominion Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa, Ont. General contractors, Randolph Macdonald Co., Queen and Victoria Sts., Toronto, Ont.

Burlington, Ont.

Cement bridges, Caroline and Pearl. Clerk, Jas. S. Allen. General contractor, W. H. Murphy, Burlington.

Fort William, Ont.

Dock, cost $5,000, Island 2, for W. H. Dwyer, Ltd., Ottawa and Fort William. Builder, D. A. Gordon, Fort William. 205 x 12.

Howard Twp., Ont.

Bridge, cost $4,646, Lake Shore Road. Clerk, George McDonald, Ridgetown. General contractor, A. S. Everitt, care Clerk.

Halifax, N.S.

Cable station and wharf, cost $65,000, for Western Union Telegraph Co., Hollis street. Architect, R. A. ohnson, 16 Barrington street. General contractor, G. B. Low, 7 Oakland Road. Two stys., 100 x 100.

Harriston, Ont.

Crow's Bridge. Owners, Counties of Grey and Wellington. Engineers, Bowman & Connor, 36 Toronto street, Toronto. Steel, Alexander Hill, Mt. Forest. Abutments, Cole & Bryson, Owen Sound. 43 ft. steel and concrete.

Twp. of Hibbert, Ont.

Three bridges, cost $3,525, for Twp. Council. Clerk, James Jordan, Dublin. County Engineer, John Roger, Mitchell.

Montreal, Que.

Freight sheds and offices, cost $90,000, Wellington, for G. T. R., McGill street. Architect and builder, John S. Metcalfe Co., Ltd., 54 St. Francois Xavier street. Roofing to be awarded. Heating and plumbing, Guarantee Heating & Plumbing Company, 41 Devienne street. Other work done by builder.

Ottawa, Ont.

Canal lock gates, cost $250,000. Dominion Government, Dept. Railways & Canals. Secretary, L. K. Jones, Ottawa. General contractors, Roger Miller & Sons, Lumsden Bldg., Toronto. Forty double lock gates north of Trenton.

Public Buildings, Churches Schools, etc.

Brampton, Ont.

Addition to Central School, cost $4,000, planned by Town Council. Clerk, W. H. McFadden.

Hull, Que.

Incinerator under contemplation. Mayor, Mr. Dupuis. City Engineer, J. A. Laforest.

Marshville, Ont.

School. Separate tenders received by Sec.-treas., Wm. W. Simpson, until July 12th for masonry and carpentry. Plans, etc., at office of Sec.-treas. 39 x 45, brick construction.

Montreal, Que.

Theatre, cost $70,000, for Peter Griffin Theater Co., c/o H. Lubin & Co., 87 Notre Dame W. Plans will be prepared.

Point Grey, B.C.

Addition to fire hall contemplated. Clerk, G. C. Heighway, Kerisdale. Council has decided to start work as soon as possible.

St. Thomas, Ont.

Public building, interior fittings, for Dom. Govt., Dept. of Public Works. Tenders received by Secretary, R. C. Desrochers, Ottawa, until July 9th. Plans, etc., at offices of Thos. Hastings, Clerk of Works, Postal Station "F," Yonge street, Toronto. W. G. Luton, Caretaker of Building, St. Thomas, or Secretary, Public Works Dept. Electric light fixtures, wiring, etc., for public building.

Toronto, Ont.

Incinerator, cost $1,000,000, planned by Board of Control. Mayor H. C. Hocken, City Hall. Street Commissioner Wilson and Dr. Hastings, M.H.O., are now considering sites for four buildings. Above amount was voted by ratepayers Jan 1st.

Theatre, cost $8,000, Bertmount and Queen, for Hutchinson & Webb; 1 Grenadier Rd. Architect, A. J. Rattray, 123 Bay street. Tenders in, contracts not awarded yet. One storey, 26 x 110, structural steel and brick construction.

Schools. Board of Education have approved plans for 4-room enlargement to Pape Ave. School and 6 rooms to Shirley street.

Registry office. The Board of Control invites competitive plans for above office. Pamphlet with full information may be obtained from City Architect after July 2nd. Drawings to be sent to City Clerk before September 1st.

Windsor, Ont.

School repairs planned by the Board of Education. Secretary, Alex. Black. Dougal Ave. School, plumbing, Robert Paddon & Co.; painting, J. Lauckner; Park Street School, kalsomining, painting and varnishing, Peter S. Love.

Winnipeg, Man.

Shingling church, Arlington street, for St. Edwards R. C. Congregation. Architect, D. W. Bellhouse, 703 Canada Bldg. Tenders will be received by general contractors, Fred Lewis Co., Ltd., 637-9 Somerset Bldg.

CONTRACTS AWARDED

Chatham, Ont.

Sunday school, cost $10,000, planned by Methodist Trustees. Pastor, R. G. Fulton. Work being done by day labor. Foundations in.

Fort William, Ont.
Addition to school, cost $15,000, Isabella. Architect, R. E. Mason. General contractor, Chas. E. Ward. Foundations in.

Kaslo, B.C.
School, cost $40,000, for Public School Board. Secretary, W. H. Burgess. Architect, W. Haldane, Nelson. General contractor, J. Dancy & Co., Nelson. Heating and plumbing, B. C. Heating & Plumbing Co., Nelson. Three storeys and basement, six rooms, brick construction.

Montreal, Que.
School, cost $25,000, Laval avenue, for Comsn. School, St. John Baptiste. Builder, general contractor and mason, P. Jos. Charlebois, 1234 St. Hubert. Heating and plumbing, J. & C. Brunet & Co., 223 St. Lawrence. General contractor will receive tenders for other trades. Three storeys, 44 x 44, concrete foundation, terra cotta and brick construction.

Church, cost $120,000, Bernard and Waverly, for St. George's Church, Laurier Ward. Architects, Gauthier & Daoust, 180 St. James street. General contractors, Belanger Freres, Valleyfield, Que.

Presbytery, cost $18,000, Bernard and Waverly, for St. George's Parish, Laurier Ward. Architects Gauthier & Daoust, 180 St. James St. General contractor, Theo. Leuard, 210 Park ave.

Garage and display hall, cost $50,000, near 963 St. Catherine W., for Motor Import Co., St. Catherine W. and Atwater. Architect, J. A. Godin, 269 St. Dennis street. General contractors, Mount Royal Construction Co., care architect. Three storeys, 75 x 103,

Alteration to St. Patrick's Orphanage, cost $8,000, Ellerslie ave. and St. Catherine Road. Engineers, Nygren, Tenney & Ohmes, New Birks Bldg. General contractor, Thos. O'Connell, 183 Ottawa street. Putting in new boiler and renovating heating and plumbing.

Addition to school for Protestant School Commissioners, Montreal West. Architects, Peden & McLaren, 20 St. Alexis. General contractors, Reid, McGregor & Reid, 14 Guy Block. Carpenter, T. S. Hudson, B12 Board of Trade.

Ottawa, Ont.
Addition and alterations to Rideau Hall, cost $125,000. Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa, Ont. General contractor, Peter Lyall Co., Montreal, Que.

St. Anne de Bellevue, Que.
Church, cost $25,000, for Union Church Congregation. Architects, Peden & McLaren, 20 St. Alexis street, Montreal. General contractor, S. W. Hamilton, 402 Bleury. 36 ft., 40 x 67, stone foundation, brick construction. General contractor will receive tenders about July 2nd for heating, plumbing, electric lighting and roofing.

St. John, N.B.
Infirmary for Catholic Diocese, Sisters of Charity, c/o Bishop Le Blanc, Waterloo street. Foundations in.

Sunday School Building, for Germain Street United Baptist Church. Pastor, F. S. Porter, Queen street. Architect, F. Neil Brodie, 42 Princess St. General contractor, R. A. Corbett, Douglas ave.

St. Thomas, Ont.
Gymnasium and manual training building, cost $10,334, for Board of Education. Secretary, J. C. Spencer. General contractors, Wey & Howe, care secretary. White brick construction.

Springhill, N.S.
Church, cost $18,000, Main street, for Methodist Congregation. Rev. Harry B. Clarke. Builders and general contractors, McLellan Bros. Heating, plumbing, electrical work and interior fittings, not let. Wood and frame construction. Seating capacity 1,000.

Sandwich, Ont.
Public school, cost $45,000. Secretary, David Tasker. Architects, Van Leyen & Schilling, 1115-21 Union Trust Building, Detroit, Mich. General contractors, Wells & Grey, Windsor. Heating and plumbing, Pennington & Brian, Windsor. Two storeys, 50 x 141.

Toronto, Ont.
Theatre for Pollock & Stein. Architect, G. D. Redmond, Dineen Building. Excavating and masonry, Orr Bros., Queen E. Heating, W. J. Sutherland, 140 Galley ave. Plastering, Hodson & Warren, 815 Dovercourt Rd. Roofing, Reggan & Spence, 530 Front St. W. Electric wiring, Can. Elec. Fixtures & Contracting Co., 13 Queen E.

School (painting) for Board of Education. Secretary, W. C. Wilkinson. Contracts for painting as follows: James Taylor, 179 Markham, Park & Pyne, $1,005; Taylor & Co., 9 Bloor St. E., Sackville & Withrow, $350. Geo. Eales, 880 Queen W., Winchester St., $390. Jas. Phinnemore, 445 Yonge St., St. Clair ave., $125.

Addition to Riverdale High School planned by Board of Education. Secretary, W. C. Wilkinson. The Shipway Iron Bell & Wire Mfg. Co., King W., has been awarded contract for iron stairs.

Church, St. Clair and Ravensden, for St. Clair Roman Catholic Congregation. Rev. R. E. McCabe, 4 Ravensden ave. Architect, A. W. Holmes, 10 Bloor E. Masonry, Fred Holmes & Son, Limited, 1113 Yonge street.

Additional Sub-contracts awarded. Technical High School, by Board of Education. Secretary, W. C. Wilkinson. Architects, Ross & MacDonald, C. P. R. Bldg. General contractors, Norcross Bros., 98 Bay street. The general contractor has sublet the following: Indiana limestone, Geo. Oakley & Son, 278 Booth ave. Excavating, Wm. H. Thomson, 29 Marlborough ave. Architectural terra cotta, Federal Terra Cotta Co., New York.

Vancouver, B.C.
Creche building, cost $3,800, for City Council. Clerk, Wm. McQueen. Architect, Alfred Williams, 509 Metropolitan Bldg. General contractor, Geo. E. Williamson, 150 6th ave. east. Two storeys and basement, reinforced concrete and brick construction.

Vancouver, B.C.
Old People's Home, cost $42,017. Clerk, Wm. McQueen. Architects, Perry & Fowler, 320 Pacific Bldg. General contractors, Campbell & Wilkie, 615 Pender street west. Two storeys, 97 x 147.

Twp. of Wallace, Ont.
School, cost $4,000. Clerk, David Greer, Brotherston, Ont. General contractor, Geo. Black, Palmerston, Ont. Pressed brick construction.

Winnipeg, Man.
Club House, cost $10,000, Pritchard ave., for J. Kojiarsky, 654 Pritchard ave. Architect and builder is owner. Two storeys, 25 x 90, stone foundation, brick construction.

Business Buildings and Industrial Plants

Coquitlam, B.C.
Hotel, cost $45,000, planned for The Coquitlam Terminal Co., will be situated in the first division between Kingsway and Tyner Road.

Edmonton, Alta.
Hotel, cost $30,000, for Jos. Mantel, North Edmonton. Three storeys, cement foundation, stone and brick veneer construction. Plans drawn.

Forest, Ont.
Addition to hardware store, cost $4,200, King, for W. Lochead, King street. Two storeys, white brick construction. Plans being prepared.

Fort William, Ont.
Warehouse, for Fife Hardware Co., Hardisty. 60 x 125, common brick construction, cement foundation, felt and gravel roofing. Plans in progress.

Hagersville, Ont.
Bank building for Union Bank of Canada. Plans prepared.

Merlin, Ont.
H. B. Bostaph, Tilbury, contemplates equipping a brick and tile manufacturing plant at a cost of $38,000.

Mimico, Ont.
Brick manufacturing plant planned by Provincial Government. Work in charge of Asst. Prov. Sec., S. A. Armstrong. Work will be done by prison labor. Capacity $10,000,000 per year.

Montreal, Que.
Offices, etc., Cote St. Paul, for Imperial Oil Co., 105 Board of Trade Bldg. Building may not be erected until next spring.

St. Catharines, Ont.
Flax mill, cost $150,000, contemplated for Canadian Flax Mills Ltd., 24 King W., Toronto. By-law passed first reading to give fixed assessment and exemptions.

Toronto, Ont.
Warehouse, cost $4,000, Queen E., for J. W. Gillard, 2173 Queen St. E. Architect and builder, W. J. Wibby, 190 Silver Birch ave. Three storeys, 26 x 48, structural steel and brick construction. Plans ready.

Windsor, Ont.
Office Building, Ouellette, contemplated by A. T. Curran. Plans will be prepared.

Windsor, Ont.
Store, cost $8,000, Pitts, for Osterhout & Little, Windsor. Architects, Leybourne & Whitney. Two storeys and basement, 85 x 26, brick foundation, brick construction. Plans in progress.

CONTRACTS AWARDED

Amherst, N.S.
Steel car plant, cost $100,000, for Canadian Car & Foundry Co. Owners are buying all material and doing work by

day labor. 1½ storeys, 160 x 400, concrete and tile roofing, telephone system, motors and generators, belting.

Burlington, Ont.

Business block, cost $9,000. Owner and builder, W. Campbell, Brant street. Two storeys, white brick construction.

Calgary, Alta.

Store and office, Eighth ave. E., for E. W. Home, 8th ave. w. Builder, A. A. Rose, David Block. Two storeys, 36 ft. 6 in. x 100, cement foundation, brick construction. Excavating started.

Blacksmith shop, cost $5,600, 3rd ave. west, for City Cartage Co., 501 3rd ave. west. Builder, P. Clansen, 720 4th ave. west. Two storeys, 40 x 100, brick construction.

Fort William, Ont.

Business block, cost $12,000, for Dr. Stewart. Builder and general contractor, R. E. Wright, Victoria ave. Two storeys, 27 x 60, Foundations in.

Hamilton, Ont.

Addition to factory, cost $20,000, Victoria ave., for Otis Fensom Elevator Co., Victoria ave. north. Architects, Stewart & Witton, 2 Hughson street south. General contractor, W. H. Cooper, 67 York St.

Hamilton, Ont.

Stables, cost $10,000, Hughson St. N., for Pure Milk Co., John St. N. Architect, A. W. Peene, Clyde Block. General contractor, Geo. F. Webb, Wentworth St. S. Painting, Peter Thompson, Walnut W.

Montreal, Que.

Store and residence, cost $10,000, Outremont (Bernard). Builder and architect, A. Desjardins, 7 Casgrain. Three storeys, 30 x 77, cement foundation, pressed brick construction. Excavating started.

Factory, cost $25,000, for Canada Wire Factory, care architects, T. Pringle & Sons, 419 Coristine Bldg. Concrete, brick and painting, Nicholson Construction Co., 960 St. Catherine W. Heating and plumbing, McKnight & Blackadder, 91 Inspector. Steel sash, Steel & Radiation, 138 Craig W. Carpenter, T. S. Hudson, C12 Board of Trade. Two storeys and basement, 50 x 75, cement foundation, brick construction.

Store and flats, cost $5,000. Architect and builder, Marcelin Betournay, 113 Verdun. Three storeys, 25 x 40, cement foundation, brick construction.

Five stores, cost $10,000, Dorchester and St. Charles Borromee, for L. Cohen & Sons, 36 Prince street. Architect and builder, C. W. Strang, 76 Plymouth Grove. 1 sty., 116 x 60, cement foundation, brick construction.

Stores and flats, cost $16,000, Ontario and Chambly, for Eug. Sansregret, 365 St. Louis. Architect and builder, M. Bourdon & Fils, 527 Panet.

Alterations to factory, cost $4,614, Ontario E., for Mederic Laurier, c/o builders, A. Kelly & Co., 1955 St. Urbain St. Architect, Jos. A. Godin, 269 St. Denis. Three storeys, 41 x 71.

Stores and flats, cost $7,000, City Hall ave., for Estate E. D. Roy, 470 Parc Lafontaine. Builder, M. Ouimet, 20 Christopher Columbus. Three storeys, 42 x 40, stone foundation, brick construction.

Store and apartments, cost $50,000, Green and Sherbrooke, for Brilon & Jarry, c/o architect, G. A. Monette, 260 St. James street. Masonry, carpentry and brick work, Peel & Peel, 710 Fullum. Steel, Phoenix Bridge Co., 83 Colborne. Painting, Jos. Guy, 325 Workman. Electrical work, Canada Electric Co., 230 Dorchester W. Plastering, A. Cusson, 38 Laporte ave. Foundations in.

Two stores and five flats, cost $15,000, Outremont (Durocher and Lajoie). Owner and contractor, A. Frenette, 212 Fabre street. Architect, Z. Trudel, 238 St. Andre. Masonry, Villeneuve & Lavallee, c/o owner. Three storeys, 90 x 50, stone foundation, brick construction, felt and gravel roofing. Architect will receive tenders for heating, plumbing, electric wiring and roofing at once.

Factory extension Lachine (St. Joseph) for the Dominion Wire Rope Co., Ltd. Builder, E. G. M. Cape, New Birks Bldg., Montreal. One storey, 90 x 91, brick construction, felt and gravel roofing. Foundations in.

Warehouse, cost $20,000, 144-6 Craig W., for H. H. Vachelle Koelle, 59 St. Gabriel street. General contractor, D. F. Sheeny, 16 St. Cecile. Repairs to building, damaged by fire.

Store and flats, cost $9,000, St. Lawrence, for D. Leonard, Ste. Monique des deux Montagnes. Architect, G. L. Leonard & Frere, 554 Parc Lafontaine. Three storeys, 50 x 60, concrete foundation, brick construction.

Store and flats, cost $5,000, St. Lawrence. Builder and owner, Leonard & Frere, 554 Parc Lafontaine. Three stys., 25 x 60, cement foundation, brick construction.

Coal shed, cost $35,000, Western ave., for Hartt & Adair Coal Co., 146 Notre Dame W. Architect, Adolphe Suck, Hyde Park, Mass., U.S.A. General contractors, Marcells Construction Co., Portmouth, New Hampshire.

Stores and flats, cost $7,000, Sixth ave., for J. Belisle, 345 6th ave., Rosemount. Architect and builder, owner. Three storeys, 25 x 58, cement foundation, brick construction.

Store and flat, cost $5,000, Amherst, for Antoine Charland, 2119 St. Catherine E. Builders, Michel Bourdon & Sons, 527 Panet. Brick, N. Beauchamp, 1559 Bordeaux. Painting, Nap. Allard, 836 Dorion. Two storeys, 21 x 66.

Ottawa, Ont.

Addition to bank, cost $3,000, Rideau, for F. G. Mager, Rideau street. Architect, J. Albert Ewart, 193 Sparks. General contractors, Smith Bros., 448 McLeod. Solid brick construction.

Stores and apartments, cost $40,000, for F. X. Laderoate, 85 Bank street. Architect, E. Measter, Creighton Street School. General contractor and carpenter, R. A. Kemp, 149 1st ave. Masonry, Cowie & More, 1st ave. Some sub-contracts not let. Foundations started.

St. John, N.B.

Warehouse and office, Prince William street for McClary Mfg. Co. Manager, Geo. S. Bishop, Chipman Hill. General contractor, owner.

Factory, Mash Rd., for Oil Motor & Mfg. Co., Ltd. Director, M. L. G. Vincent, 126 Charlotte street. Architect, F. Neil Brodie, 42 Princess street. General contractor, Jas. Myles, 175 Wright St.

Ste. Therese, Que.

Piano factory, cost $100,000, for Willis Piano Co., Drummond and St. Catherine, Montreal. Architects, Ross & MacDonald, 1 Belmont street, Montreal. General contractors, The James Shearer Co., Ltd., 225 St. Patrick street, Montreal. Three storeys, 100 x 150, cement foundation, brick, structural steel and mill construction.

Sudbury, Ont.

Warehouse. Builders and owners, Lester Brothers. Asbestos and steel or cement and brick veneer construction.

Toronto, Ont.

Stores and apartments, Queen E., for D. Abramovitch, 161 York street. Architect, I. Feldsman, 199 Yonge street. Masonry, Jenner & Evans, 775 Crawford. Carpentry, Bell & Thorps, 1211 Dufferin. Roofing, Ormsby & Co., George & Queen. Electrical, Toronto Electric Light Co., 12 Adelaide St. E. Plastering, W. J. Hynes, 718 Dupont street. Two storeys, brick construction.

One pair stores and residences, cost $7,500, Pape and Selkirk. Builder and owner, A. F. Taber, 21 Muriel. Two storeys, 40 x 43, structural steel and brick construction.

Warehouse, cost $65,000, 433 King W., for Samuel Benjamin Co., King and Spadina. Architects, Burke, Horwood & White, 28 Toronto street. Masonry, Holtby Bros., 61 Hepbourne. Carpentry, Geo. Sparling, 759 Dufferin. Plastering, W. J. Hynes, 718 Dupont street. Heating, Toronto Furnace & Crematory Co., 111½ King E. Galvanized iron, W. E. Dillon Co., 78 Richmond E. Steel, Reid & Brown, Esplanade E. Electric wiring not awarded. Six stys., 50 x 121.

Vancouver, B.C.

Office building for Credit Foncier Franco Canadian Co., 35 St. James St., Montreal. Architects, Barott Blackader & Webster, 508 New Birks Bldg., Montreal. General contractors, H. L. Stevens & Co., 119 Pender W. Cement foundation, reinforced concrete, terra cotta and limestone construction.

Victoria, B.C.

Packing warehouse, cost $55,000, Store and Telegraph streets, for Canadian Swift Co. General contractors, the B. C. Granitoid Co., Exchange Bldg., Vancouver. Two storeys, reinforced concrete construction. Complete equipment including freezers, coolers, smoke houses, power, etc., will be required.

Wallaceburg, Ont.

Business block, cost $12,000. Builder and Owner, George Warrener, Two storeys, 50 x 85, stone and cement foundation, white brick construction.

Willow River, B.C.

Hotel for Grand Trunk Pacific Railway Co. Architects, Holabird & Roche, 104 S. Michigan ave., Chicago, Ill. General contractors, Purdy & Henderson, 470 Granville street, Vancouver, B. C.

Winnipeg, Man.

Warehouse, cost $60,000, Dublin, for Dom. Bridge Co., Canada Bldg., Donald street. Architect and builder, owner. 1-sty., 108 x 272, steel construction.

Store and residence, cost $6,500, Stella ave., for M. Soronow, 217 Stella ave. Architect and builder, owner. Two stys., 30 x 33, brick foundation, brick construction.

Addition to pool room, cost $12,000, Donald street, for Chas. Plaxton, c/o architect, F. R. Evans, 506 Somerset

Bldg. General contractors, W. J. Lailey & Co., 367 Maryland street. Three stys., 64 x 22, structural steel and brick construction.

Weston, Ont.

Stores, cost $9,000. Builder and owner, J. C. Cleman. Three stores on Main.

Residences

Calgary, Alta.

Residence, cost $5,000, Elbow Park, for H. W. Allen, c/o architects, Alliance Investment Co., 711 1st St. N. Two stys., 31 x 32 ft. 6 in., frame construction.

Halifax, N. S.

Residence, cost $4,000, Oxford, for Ralph M. Hall, 51 Upper Water street. Architect, H. E. Gates, 88 Hollis street, Two storeys and pitch roof, 37 x 55, frame and stucco construction. Plans ready.

Residence and stable, cost $5,000, Oakland Rd., for Dr. Louis Saunders, 135 Barrington street. Two storeys, 40 x 28, cement foundation, frame construction, Work done by day labor. Plans ready.

Hamilton, Ont.

Residence, cost $5,000, Westmoreland, for H. Siderski, 34 James N. Architect, J. A. Armes & Walter Scott, 68 Federal Life Building. Tenders received by owner. Two storeys and basement, 30 x 45, pressed brick construction.

Montreal, Que.

Residence, cost $9,000, Lachine (Broadway), for W. E. Ranger, 368 St. Joseph. Architect, Louis Amos, 6 E. T. Bank Bldg., St. Catherine W. Three storeys, 37 x 51, cement foundation, pressed brick construction. Private tenders called by architect.

Regina, Sask.

Apartment block, cost $10,000, Dewdney street, for F. G. Stephens, Dewdney street. Architect, Mr. Miller, care owner. General contractor, A. W. McGregor, Masonic Temple. Two storevs, 25 x 52, cement and brick foundation, brick and artificial stone construction.

Toronto, Ont.

Residence, cost $5,400, Indian Road, for National Trust Co., 22 King St. E. Architect, H. G. Macklin, 36 Toronto St. Two storeys, 24 x 50, brick construction, brick foundation. Plans drawn.

Alterations to residence, cost $17,000, for J. B. O'Brien, 7 Thornwood avenue. Architect, H. F. Secord, King and Bay streets. Two storeys, 24 x 40, structural steel, reinforced concrete and brick construction, cement and brick foundation. Plans drawn.

Victoria, B.C.

Residence, cost $16,000, 1392 Rockland ave., for W. H. Wilkinson, c/o architect, H. T. Whitehead, 13 Green Block. 15 rooms. Plans prepared.

Winnipeg, Man.

Residence, cost $6,000, Ashburn, for P. J. McRae, Suite 18, Douglas Bldg., Graham ave. Two storeys, 24 x 30, stone foundation, frame construction.

Windsor, Ont.

Residence, cost $9,000, Ouellette, for Osterhout & Little, Windsor. Architects, Leybourne & Whitney. Plans in progress.

CONTRACTS AWARDED

Bedford, Que.

House and barn, cost $60,000, for C. S. Campbell, 605 Merchants Bank Bldg., Montreal. Builders, Laurentian Construction Co., 103 St. Francois Xavier St., Montreal. Cement foundation, brick construction. Excavating started.

Calgary, Alta.

Residence, cost $5,000, Houndsfield Heights, for E. J. Riley, Hill hurst. Architect, Leo. Dowler, Alexander corner. General contractor, C. Grindley, 816 6th ave. west. Frame construction.

Residence, cost $15,000, So. Mount Royal, for Hon. Justice Walsh, c/o architects and general contractors, Alliance Investment Company, 711 1st St. W. 2½ storeys, 40 ft. 8 in. x 45 ft. 8 in., stone and brick construction. Foundations in.

Edmonton, Alta.

Rooming house, cost $20,000, for John Johnston, 50 Stewart street. Architects and builders, Hardy & Markland, c/o owner. Five storeys, cement foundation, frame construction.

Two residences, cost $8,000, 26th St., for E. Arrowsmith, General Delivery. Architect and general contractor, owner. Two storeys, 24 ft. x 29 ft., cement foundation, frame construction.

Residence, cost $5,000, 32nd street, for Mallitt Bros., 1545 26th ave. Architect and general contractor, owner. Two stys., 32 ft. x 34 ft., cement foundation, frame construction.

Residence, cost $5,000, for A. W. Cairns, 91 5th ave. Architect, E. A. Cowley, 406 Agency Block. General contractors, Mallet Bros., 1545 26th St. Two storeys, 30 x 33, concrete foundation, frame construction.

Residence, cost $5,500, Huston. Architects and builders, Magrath Hart & Co., General Delivery. 2½ storeys, 28 x 31, cement foundation, frame construction. Excavating done.

Edmonton South, Alta.

Residence, cost $7,500, 3rd ave. north, for Mrs. Alex. Benson, Box 4167 Edmonton So. Architect, Cyril Fry. General contractor, Albert Moreside, 1st ave. northeast. Two storeys, 30 x 40, concrete and cement foundation, pressed brick construction.

Halifax, N.S.

Residence, cost $4,000, for H. P. Story, Waegwoltic ave. Builder and general contractor, masonry, iron and steel, painting and heating, Thompson & Theakston, Hollis street. Two storeys, 35 x 45, cement foundation, frame construction.

Levis, Que.

Residence, cost $5,000, St. Onesime, for Damase Blais, St. Onesime St., Levis. Builder and general contractor, owner. Three storeys, 30 x 45, brick construction.

Montreal, Que.

Six flats, cost $9,000, Panet, for A. Martineau, c/o Geo. Bail. Architect and builder,102 Stadacona. Three storeys, 50 x 40, cement foundation, brick construction.

Four flats, cost $14,000, Marlowe. Architects, builders and general contractors, Jos. Belisle & Frere, 808 Papineau. Three storeys, 25 x 40, brick construction, cement foundation. Owner will receive tenders for brick work and electrical work. Excavating started.

Two residences, cost $12,000, Westmount (Lansdowne ave). Architect and builder, Isaac Collins, 207 Ash ave. Owner does his own work. Two storeys and basement, 25 x 45, brick construction. Foundations in.

Residence, cost $8,000, Beaulieu, for British Construction Co., 238 St. James street. Architect and builder, owner. 3-storeys, 50 x 70, hardwood floors. Owners will receive tenders for painting only.

Alterations to residence, cost $5,000, for A. R. Tourgis, 444 Durocher. General contractor, Art. Chausse, c/o owner. One storey, 25 x 25.

Six flats, cost $9,000, Colonial. Builder and owner, Geo. Bail, 102 Stadacona. Roofing, heating, plumbing and electrical work, Jos. St. Amand, 109 Laurier W.

Eighteen flats, cost $16,000, Colonial, for Geo. Bail and E. Vincent, 102 Stadacona. Architect and builders, owners. Roofing, heating, plumbing and electrical work, Jos. St. Armand, 109 Laurier W.

Twelve flats, cost $30,000, Park ave., for E. Goldfine & Chananie, 3 Ontario W. Builder, G. Bail and E. Vincent, 102 Stadacona street. Three storeys, 90 x 45, cement foundation, stone and brick construction. Builders will receive tender for heating, plumbing, roofing and electric wiring.

Residence, cost $15,000, Westmount, for F. McNally, 405 Aqueduct. Architect, W. E. Doran, 189 Bleury street, Montreal. Roofing, Campbell, Gilday Co., 663 St. Paul. Painting, H. Daniels, 139 Fulford. Heating and plumbing, T. Lessard & Sons, 191 Craig E. Electrical work, Moncel Electric Co., 157 Craig W. Plasterers, R. D. Clark & Sons, 26 Lincoln ave.

Flats, cost $7,500, for J. A. Courchesne, 1815 Chateaubriand, architect and builder. Three storeys, 50 x 45, concrete foundation, brick construction.

Residence, cost $10,000, Esplanade ave., for Fred Vincent, 207 Esplanade. Architect, W. E. Doran, 189 Bleury St. Carpentry, A. Kelly & Co., 1955 St. Urbain. Heating and plumbing, J. J. Briard, c/o architect. Electrical work, Moncel Electric Co., 157 Craig St. W.

Six flats, cost $6,000, Fabre, for F. St. Louis, 496 Fabre, architect and builder. Three storeys, 47 x 40, concrete foundation, brick construction.

Six flats, cost $7,000, Stadacona. Builder and owner, Frs. Tremblay, 201 Aylwin. Three storeys, 51 x 60, cement foundation, brick construction.

Flats, cost $25,000, Park ave., for Osias Lamoureux, 15 St. James street, Architect, Art. St. Louis, 80 St. Gabriel. Owner will do all the work. Three storeys, 100 x 100, cement foundation, stone and brick construction. Excavation started.

Flats, cost $6,000, Forsyth, for Dr. G. H. Martineau, 341 Forsyth. Builder, A. Roberge, 786 Garnier. Roofing, heating and plumbing, F. Paquette, 586 St. Timothee. Three storeys, 25 x 76.

Residence, cost $8,000, Outremont (Elmwood) for Mrs. A. Chevalier, 3400 St. Lawrence Blvd. Architect, Z. Trudel, 238 St. Andre. Builder and general contractor, J .A. Lamontagne, 3061 St. Dominique. Two storeys, 23 x 56, stone foundation, brick construction.

Four flats, cost $7,000, Belgrave. Owner and builder, Lenon Alarie, 2461 Clark. Two storeys, 25 x 60, cement foundation, brick construction. Excavating started.

(Continued on page 75)

Tenders and For Sale Department

CITY OF PRINCE ALBERT,
SASKATCHEWAN

Tenders will be received, addressed to the City Clerk, Prince Albert, Sask., until noon, Wednesday, July 16th, 1913, for the following contracts:

13 D—Laying approximately 22,000 feet of steel water main.

13 E—Laying approximately 25,000 feet of steel water main.

13 F—Laying approximately 26,000 feet of sewers.

13 G—Laying approximately 25,000 feet of sewers.

Plans and specifications are on file at the office of The Canadian Engineer, Union Bank Building, Winnipeg, and at the office of the City Engineer, Prince Albert. Instructions to bidders and form of tender may be had on application to the City Engineer. Plans and specifications not to be sent out.

The lowest or any tender not necessarily accepted.

M. H. BAKER, City Engineer.
N. W. MORTON,
H. E. M. KENSIT,
C. O. DAVIDSON, City Commissioners.
Prince Albert, Sask.,
June 23rd, 1913. 27-28

Department of Railways and Canals, Canada

TRENT CANAL

Steel Pontoon Gate Lifter

Notice to Contractors

Sealed tenders addressed to the undersigned and marked "Tender for Steel Pontoon Gate Lifter, Trent Canal," will be received at this office until 16 o'clock on **Tuesday, July 29th, 1913.**

Plans, specifications and form of contract to be entered into can be seen on or after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Superintending Engineer, Trent Canal, Peterborough, Ont.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labour, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of $1,000, made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES.
Asst. Deputy Minister and Secretary.
Department of Railways and Canals,
Ottawa, 25th June, 1913.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.—44228. 27-28

Sealed tenders addressed to the undersigned and endorsed "Tender for Public Building, Lakefield, Ont.," will be received until 4 p.m., on **Monday, July 21, 1913**, for the construction of a Public Building at Lakefield, Ont.

Plans, specifications and form of contract can be seen and forms of tender obtained on application to the Postmaster at Lakefield, Ont., at the office of Mr. Thos. Hastings, Clerk of Works, Postal Station "F," Yonge St., Toronto, and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, June 26, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—42451. 27-28

Sealed tenders addressed to the undersigned, and endorsed "Tender for Public Building, Hanover, Ont.," will be received until 4 p.m., on **Monday, July 21, 1913**, for the construction of a Public Building at Hanover, Ont.

Plans, specification and form of contract can be seen and forms of tender obtained on application to the Postmaster at Hanover, Ont., at the office of Mr. Thos. Hastings, Clerk of Works, Postal Station "F," Yonge St., Toronto, and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signature, stating their occupations and places of residence. In the case of firms the actual signatures, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, June 26, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—42596. 27-28

Sealed tenders addressed to the undersigned and endorsed "Tender for Supplying Coal for the Dominion Buildings," will be received at this office until 4 p.m., on **Monday, July 14, 1913**, for the supply of coal for the Public Buildings throughout the Dominion.

Combined specification and form of tender can be obtained on application at this office and from the caretakers of the different Dominion Buildings.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the contract. If the tender be not accepted the cheque will be returned.

By order

R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, June 14, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—42889. 26-27

TOWN OF WALKERVILLE

Tenders for Pavements

Sealed tenders will be received by registered post, addressed to the undersigned, up to **Friday noon, the 11th day of July, 1913**, for the construction of concrete pavements on the following streets in the town of Walkerville:

On Huron street from Walker Road to Monmouth Road.

On Windermere Road from present pavement to Ottawa street.

On Alley south side of Sandwich street to north side of Assumption street.

On Victoria Road from Huron street to Ottawa street.

On Devonshire Road from Ontario street to Devonshire Court and Devonshire Court from Argyle to Kildare Road.

On Ottawa street from Argyle Road to Windermere Road.

On Argyle Rd. from Huron street to Ottawa street adn from Essex Terminal Company's land northerly to present pavement on Argyle Rd.

On Kildare Rd. from Huron St. to Essex Terminal Railway.

On Ontario street from Devonshire Road to Windermere Road.

On Huron street from Monmouth Road to Lincoln Road.

On Ontario street from Walker Road to Monmouth Road.

On Alley west of Kildare Road from Assumption street to Brant street.

Plans and specifications may be seen on application to Mr. Owen McKay, C.E., Walkerville.

Tenders must be accompanied by a marked cheque, payable to the Town Treasurer, equal to 2½ per cent. of the amount thereof.

Should any party whose tender is accepted fail to execute the necessary contract and bond for the due fulfilment of the same, his deposit will be forfeited to the Town.

Deposits of unsuccessful tenderers will be returned.

The lowest tender not necessarily accepted.

The names of two responsible persons willing to act as sureties must accompany each tender.

CECIL H. ROBINSON,
Town Clerk.
Walkerville, Ont.
26th June, 1913. 27

VILLAGE OF MERRITTON

SIDEWALKS

Sealed tenders, marked "Tender for Sidewalks," addressed to R. Clark, Municipal Clerk, Merritton, Ontario, will be received until six o'clock p.m., **July 10, 1913**, for approximately 150,000 square feet of Concrete Sidewalks.

Plans, specifications, and forms of tender, may be obtained on application to the Municipal Clerk, Merritton, or at the Engineer's office, St. Catharines.

An accepted bank cheque for the sum of $500, made payable to the Corporation Treasurer, must accompany each tender.

The lowest or any tender not necessarily accepted.

R. CLARK, Clerk,
Merritton, Ont.
F. N. RUTHERFORD, C. E.,
26-27 24 Queen St., St. Catharines, Ont.

TOWN OF THOROLD
Province of Ontario

PAVEMENTS

Sealed tenders will be received by the Town Clerk until 8 p.m. on **Friday, July 4th, 1913**, for constructing permanent pavements on portions of the following streets:—

(a) Regent Street and Front Street, Brick Pavement with Concrete Curb.
(b) Pine Street, Bitulithic or other pavement, with Concrete Curb and Gutter, and brick on railway track allowance.
(c) Vine street, Clairmont street, and Portland street, Bitulithic or other pavement, with Concrete Curb and Gutter.

No tender necessarily accepted.

Plans, specifications, etc., may be seen at the Town Hall, Thorold.

For further information address the Engineers, Mail Building, Toronto.

JOHN BRODERICK, Esq., Mayor.
D. J. C. MUNRO, Esq., Town Clerk.
CHIPMAN & POWER, Engineers.
26-27

Notice to Contractors

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on **Tuesday, July 8th, 1913**, for the construction of the following sewers:—

Lane 1st N. Dale ave., Glen Rd. to east end.
Columbine ave., Rainsford Rd. to Kingston Rd.
Columbine ave. Rainsford Rd. to Woodbine ave.
Jones ave., Danforth ave. to 1407 feet north.
Braemore Gardens, Christie St., to Christie St.
Lane 2nd N King St., Princess St. to West End.
Clara St., Conduit St., to Quebec ave.
Beresford ave., Bloor St. to north end.
Wheeler ave., Queen St., to 1350 ft. north.
Morley ave. 250 ft. S. Gerrard St. to Gerrard St.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications may be seen and forms of tender obtained at the office of the Commissioner of Works, Toronto.

The tenderers shall submit with their tender the names of two sureties approved of by the City Treasurer, not members of the City Council, or officers of the Corporation of the City of Toronto, or in lieu of said sureties, the bond of a guarantee company approved of as aforesaid.

The usual conditions relating to tendering as prescribed by City By-law must be strictly complied with.

The lowest or any tender not necessarily accepted.

H. C. HOCKEN, Mayor,
Chairman, Board of Control.
Toronto, June 26th, 1913. 27

Tenders Wanted

Tenders will be received by the undersigned up to 5 o'clock p.m. on **Monday, the 7th day of** July, 1913, for the construction of a system of sewers on the following streets, in the Town of Petrolia.

1. For digging the trench, laying tile, and filling in the trench.
   (a) On West street, from Petrolia street to Jennie street.
   (b) On Jennie street, from West street to Maud street.
   (c) On Maud street, from Jennie street to outlet at Trunk Sewer.
   (d) On Maud street from Petrolia street to Jennie street.
   (e) On Dufferin avenue, from a point 75 feet west of Princess street to Maud street.
   (f) On Huggard street, from Petrolia street to Jennie street.
   (g) On Station street, from Petrolia street to a point 230 feet north.
   The Corporation to furnish the Glazed Tile.
2. Separate tenders may be submitted for any of the above sections, or any one tender may cover the whole work.

Tenders may also be submitted for digging the trench, furnishing the tile, laying the tile, and filling in the trench.

Plans and specifications of the work may be seen at the Clerk's office.

The lowest or any tender not necessarily accepted.

27 J. McHATTIE, Town Clerk.

CITY OF REGINA

SIDEWALKS

Sealed tenders addressed to the City Commissioners, Regina, will be received up until 12 o'clock noon, **July 9th, 1913**, for the following works:—

Construction of approximately 500,000 sq. ft. of concrete sidewalk.

All information regarding the above may be obtained on application to F. McArthur, City Engineer.

A marked cheque for 5 per cent. of the amount of the bid must accompany each tender.

The city reserves the right to divide the work into two or more contracts, and to reject any or all tenders.

J. MARTIN, Mayor.
L. A. THORNTON,
J. A. REID, City Commissioners.
26-27

TENDERS

Concrete Bridge at Saskatoon

Sealed tenders will be received up to 16.30 o'clock on **Tuesday, the 15th day of July, 1913**, for the under-mentioned work:—

Construction of a concrete bridge over the South Saskatchewan River at Saskatoon.

Tenders for this work must be accompanied by accepted cheque on a chartered bank, or other satisfactory deposit for the sum of $15,000. Deposits of unsuccessful tenderers will be returned when contracts are signed.

The right to reject any or all tenders, or to waive any defects or irregularities therein is to be at the discretion of the Chairman of the Highway Commission.

Plans, specifications, forms of tender and all information may be obtained on application to the undersigned.

A deposit of $50 must accompany each request for copy of plans and specifications; this amount will be refunded on the return of the plans.

The unauthorized insertion of this advertisement will not be paid for.

A. J. McPHERSON,
Chairman, Board of Highway Commissioners.
Regina, Saskatchewan.
June 20th, 1913. 26-28

EXTENSION OF TIME

Tenders For Bridge

Sealed tenders will be received up to 5 p.m., **July 9th, 1913**, for the erection of a Warren Truss Steel Bridge to be built over the Sauble River between the Townships of Arran and Sullivan, and for concrete abutments for same, and also for steel piling which may be used instead of concrete. Plans and specifications may be seen with James Warren, Engineer, Walkerton, or with the undersigned.

(Signed) S. K. EWART,
Chesley, Ont.
Walkerton, June 13, 1913. 26-27

Tenders for Dredging

Sealed tenders will be received at the Clerk's office, Chatham, Ont. (where plans and specifications can be seen) up to 12 o'clock noon, on **Thursday, July 31st, 1913**, for dredging about 9 miles of drainage work in the Township of Dover, County of Kent. The work to be let subject to the final passing of the By-law.

The lowest or any tender not necessarily accepted. Tenders must be marked "Tenders for Dredging," and each accompanied with a marked guarantee cheque for $2,000.

Dated, June 17th, 1913.

H. M. BEEHARD, Reeve.
JOHN WELSH, Clerk,
26-30 Chatham P. O.

Department of Railways and Canals, Canada

WELLAND CANAL

Broad Creek Culvert

Notice to Contractors

Sealed tenders, addressed to the undersigned and marked "Tender for Broad Creek Culvert, Welland Canal," will be received at this office until 16 o'clock on **Thursday, July 10th, 1913.**

Plans, specifications and form of contract to be entered into can be seen at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Superintending Engineer, St. Catharines, Ont.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labour, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of $1,000 made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES,
Asst. Deputy Minister and Secretary.
Department of Railways and Canals,
Ottawa, 30th June, 1913.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.—44379. 27

Tenders for Sewers

Sealed tenders addressed to John Morrison, City Clerk, Woodstock, Ont., will be received up to **Thursday, the 10th day of July at 6 p.m.**, for the construction of about 2,800 lineal feet of sewers. Plans, specifications and forms of tender at the City Engineer's office.

JAS. MITCHELL,
Chairman, Board of Works.
F. J. URE, City Engineer. 27

To Contractors

Concrete Paving

OAKVILLE, ONT.

Sealed tenders addressed to the Chairman of Committee, will be received until noon on **Thursday, the 10th day of July, 1913**, for laying approximately 12,800 square yards of armoured, reinforced concrete pavement and 9,000 lineal feet of curbing.

Plans and specifications can be seen at The Star Office, Oakville, and at the office of J. A. Bell & Son, C. E., St. Thomas.

The committee do not bind themselves to accept the lowest or any tender.

C. H. CROSS,
Chairman Streets Committee, Oakville, Ont.
27

Department of Railways and Canals, Canada

Beauharnois Canal

Protection Work for Valleyfield Government Dam

Notice to Contractors

Sealed tenders, addressed to the undersigned and marked "Tender for works for protecting the Government dam at Valleyfield," will be received at this office until 16 o'clock on **Friday, July 18th, 1913.**

Plans, specifications and form of contract to be entered into can be seen on or after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Superintending Engineer, Quebec Canals, Montreal, Que.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labour, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of $3,000 made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering decline entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES,
Asst. Deputy Minister and Secretary.
Department of Railways and Canals,
Ottawa, June 25th, 1913.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.—44229. 27-28

Special Notice

Every man who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works are advertised.

Send along your plans when asking for tenders put a line in your advertisement to that effect.

No extra charge is made for filing plans at one or all four offices.

Contract Record and Engineering Review

Montreal—119 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—429 Pender Street.

Tenders for Pumping Station at Foot of Woodbine Avenue

Bulk tenders only will be received by registered post only, addressed to the undersigned, up to noon on **Tuesday, 8th July, 1913**, for the above building.

Plans and specifications may be seen and forms of tender and all information obtained at the office of the City Architect, City Hall, Toronto.

Envelopes containing tenders must be plainly marked on the outside as to contents. The usual conditions relating to tendering as prescribed by city by-laws must be strictly complied with, or tenders may not be entertained.

Tenderers shall submit with their tender the names of two personal sureties or the bond of a Guarantee Company approved by the City Treasurer.

The lowest or any tender not necessarily accepted.

H. C. HOCKEN, Mayor,
Chairman of the Board of Control.
City Hall, Toronto, June 21st, 1913. 27

TENDERS
FOR
Concrete Conduit

Sealed proposals will be received at the offices of the Water Commissioner, City Hall, until 12 noon, July 15th, 1913, for the fabrication and laying of about 27½ miles of reinforced concrete pipe and appurtenances on the line of the Sooke Water Supply gravity conduit, and in accordance with the requirements of the general specifications prepared by Wynn Meredith, Consulting Engineer, for such construction, pursuant to the provisions of By-law No. 814, and adopted by the Council.

Plans and specifications can be seen, and forms of tender obtained, at the Sooke Water Supply Office, 1414 Douglas street, Victoria, B.C.

The lowest or any tender not necessarily accepted.

C. H. RUST,
Water Commissioner.
Victoria, B.C., June 14th, 1913. 26-28

Tenders Wanted

Tenders for the construction of Cement Abutments for a proposed bridge across Big-Creek, lot 11, Con. 12, in the Township of Burford, will be received by the undersigned up to and including the **14th day of July, 1913.**

Plans and specifications may be seen at the home of Mr. Burtis (Deputy Reeve) Hatchley (on Tilsonburg Branch G. T. R.)

F. W. TAYLOR,
27-28 Township Clerk.

To Contractors

Sealed tenders, marked "Tenders for Work," addressed to the undersigned, will be received at this Department until **Tuesday, July 15th**, for all work, excepting heating, plumbing and wiring required in the erection of a Court House and Registry Office at Haileybury; a Court House at Fort Frances; Poultry Building at the Ontario Agricultural College, Guelph; Dormitory Building at the Ontario Institution for the Blind, Brantford, and Dormitory Building at the Ontario Institute for the Deaf and Dumb, Belleville.

Plans and specifications can be seen at this Department and at the above named Institutions, and by applying to the Sheriffs at Haileybury and Fort Frances.

No tender will be considered unless accompanied by an accepted bank cheque, payable to the Honourable J. O. Reaume, Minister of Public Works, for 5 per cent. of the amount of tender, and the bona fide signatures and addresses of two sureties or the name of a Guarantee Company approved by this Department, willing to furnish bonds for the due fulfillment of the contract, must accompany each tender.

The Department is not bound to accept the lowest or any tender.

By order,
H. F. McNAUGHTEN,
Secretary, Public Works Department.
Department of Public Works, Ontario,
Toronto, June 30th, 1913.

Newspapers publishing this advertisement without authority, will not be paid for it. 27-28

Tenders for Dredging

Sealed tenders, addressed to the undersigned and endorsed "Tender for Dredging, Collingwood, Ont.," will be received until 4 p.m. on **Monday, July 7th, 1913**, for dredging required at Collingwood, Ont.

Tenders will not be considered unless made on the forms supplied, and signed with the actual signatures of tenderers.

Combined specification and form of tender can be obtained on application to the Secretary, Department of Public Works, Ottawa. Tenders must include the towing of the plant to and from the work. Dredges and tugs not owned and registered in Canada shall not be employed in the performance of the work contracted for. Contractors must be ready to begin work within thirty days after the date when they have been notified of the acceptance of their tender.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, for five per cent. (5 p.c.) of the contract price (no cheque to be for less than $15,000), which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, 28th June, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department. 27

CITY OF REGINA, SASK.

TENDERS

Sealed tenders will be received by the City Commissioners at Regina, Sask., up until noon of **July 12th** for the supply of: Two vertical shaft, motor driven, centrifugal pumps to operate against 22 foot head, capacity 12,500 gallons per minute each.

Tender to be accompanied by a marked cheque for 5 per cent. (five per cent.) of the amount of tender.

Further particulars may be obtained from E. W. Bull, Superintendent of Light & Power Department, Regina, Sask. 25-28

Canadian Pacific Railway Company

North Toronto Grade Separation

Notice to Contractors

Sealed proposals will be received by the undersigned up to 12 o'clock noon on **Saturday, July 12**, for the construction of the substructure of a subway to be built at Yonge Street, at North Toronto.

Plans and specifications can be seen at the office of the Engineer of Grade Separation at No. 262 Avenue Road, Toronto, where proposal forms can also be obtained.

B. RIPLEY,
Engineer of Grade Separation.
Toronto, June 26th, 1913. 27-28

For Sale

300 tons new No. 30 rail and plates.
2 Porter Locomotives, 15-ton, standard gauge.
50 4-yd. one-way Dump Cars, standard gauge.
1 pile Driver, 35 ft. Leads, 2600 lb. Hammer.

Apply, J. J. GARTSHORE,
26-27 58 Front St. W., Toronto, Ont.

Piles For Sale

A carload of piles 30 to 40 ft. in length not needed on present. Will sell lot cheap.

BISHOP & BUCHANNAN,
24-27 Owen Sound, Ont.

BARGAINS!

1 Thew Steam Shovel, used less than 90 days, shop number 690; like new	$3,300
30 1½-yd. dump cars, 36-in. gauge; practically new. Each	30
1 American Well Air Compressor, 12 x 12 x 14, 340 ft. capacity, new	440
1 Rand Belted Air Compressor, 10 x 14; A.1.	240
1 Buckeye Trenching Machine, steam driven; cuts trench 27-in .wide to 8 ft. deep. Overhauled and A.1.	2,500
2 American, 6¼ x 10, D.C., D.D. Hoisting Engines with boilers and boom swingers, A.1. Each	725
1 Three-drum Stronsburg 7 x 10 Hoisting Engine with boiler; practically new.	725
1 Gates No. 5 Crusher, 2 arm Spider, rear drive (Rebuilt B.) Exceptionally low price.	

For anything else second-hand, write

WILLIS SHAW MACHINERY CO.

New York Life Building, Chicago, Ill.

Residences

(Continued from page 71)

Residence, cost $5,000, Melrose, for G. L. Robertson, 10 Chestnut ave. Architects and builders, Robertson Bros., 10 Chestnut ave. Two storeys, 25 x 45, concrete foundation, brick construction, felt and gravel roofing.

Residence, cost $11,300, Wood and Holton. Owner and builder, Mr. Jno. Allan, 300 Atwater ave. Two storeys and basement, 26 x 65, cement foundation, brick construction. Excavating started.

Cottage, cost $15,000, Outremont (Maplewood), for E. J. Chapleau, 147 Laval ave. Architect, G. A. Monette, 260 St. James. Brick and masonry, Martineau, Bisson & Lawrence, 643 Berri St. Carpentry, Special Construction Company. Heating and plumbing, Belisle & Frere, 808 Papineau. 2½ storeys, 33 x 57, cement foundation, buff brick construction, copper cornices.

Residence, cost $6,000, Brock, for G. M. Wynn, 2422 Park ave. Builder and general contractor, C. E. Deakin, Sommer Bldg. Two storeys and basement, 25 x 50, brick and terra cotta construction.

Residence, cost $7,000, Fenwick, for Capt. A. Reid, 163 Mansfield street. Builder and general contractor, J. J. Kirkpatrick, Montreal West. Frame construction.

New Hamburg, Ont.

Residence, cost $7,000. Builder and owner, Ed. Merner. One storey, brick and frame construction.

Ottawa, Ont.

Apartments, cost $10,000, Clarence, for O. Gallie, 206 Clarence. General contractor, E. Monette, 60 Stirling. Three storeys, 64 x 40, solid brick construction, Foundations in.

Port Stanley, Ont.

Rooming house, cost $6,000, for Littlejohn & Dyker, Aylmer. General contractor, Samuel Wilson, Port Stanley. 2-storeys, frame construction.

Toronto, Ont.

Addition to residence, cost $20,000, 84 Queens Park, for E. R. Woods, 84 Queens Park. Architect, E. G. Bird, King and Bay streets. General contractors, Norcross Bros., King and Bay. 1-storey, 25 x 40, structural steel, art stone and brick construction.

Residence, cost $5,000, Wells Hill. General contractor and owner, J. Singer, 133 Queen west. Heating, wiring and plumbing not yet awarded. 2½-storeys, 22 x 36, brick construction.

Residence, cost $25,000, Nina and Wells Hill, for J. Dinwoody, 28 Bracondale Ave. Architects, Harvey & Haffa, Bay street. Mason, F. & A. E. Ham, 83 Salem Ave. 2½-storeys. Other contracts to be awarded shortly.

One detached residence, cost $5,000, Braemore. Builder and owner, R. C. Bustard, 7 Queen east. 2½-storeys, 22 x 34, brick construction.

Detached residence, cost $5,000, Briar Hill road, for R. Woods, 32 Briar Hill road. Architect and builder, R. Fry, 52 Castlefield Ave. 2½-storeys, 24 x 36, brick construction.

Westboro, Ont.

Residence, cost $5,000, Cole. General contractor and owner, W. Peart, Cole Ave. 2½-storeys, solid brick construction.

Winnipeg, Man.

Two residences, cost $6,000, Beresford Ave., for J. W. Parker, 473 Beresford Ave. Two storeys, 24 x 38, stone foundation, frame construction.

Residence, cost $10,000, Harvard Ave., for Western Builders, Ltd. Architect and builders, Owner. 2½-storeys, stone foundation, frame and brick construction.

Apartment block, cost $30,000, Furby, for D. A. McArthur, 56 Furby. Architect, J. D. Atchison, Trust & Loan Bldg. General contractors, Claydon Bros., Furby Place. Three storeys, 49 x84, stone foundation, brick construction.

Apartment block, cost $35,000, Young street, for Johnnesson, 675 McDermot Ave. Architect and builder, Owner. Three storeys, 33 x 52 ft. 5 in., stone foundation, pressed and common brick construction.

Apartment block, cost $30,000, Balmoral street, for A. McBean, c/o Architect. Architect, F. R. Evans, 506 Somerset Bldg. Owner will do work by day labor. Three storeys, 51 x 103.

Five residences, cost $20,000, Clifton, for Hancox Land & Bldg. Co., 208 Nanton Bldg. Architects and general contractors, Owner. Two storeys, 20 x 28, stone foundation, frame construction.

Residence, cost $5,000, Ruby, for J. Farquhar, 269 Balmoral St. Architect and builder, Owner. 2½-storeys, 24 x 30, stone foundation, frame construction.

Two residences, cost $15,000, Grosvenor St., for Western Mutual Investment Company, 242 Somerset Bldg. General contractor, W. W. King, 358 Rosedale Ave. Three storeys, 33 x 33, stone foundation, frame and brick construction.

Power Plants, Electricity and Telephones

Brampton, Ont.

Town Council contemplate extension to lighting system. Clerk, W. H. McFadden.

Drumbo, Ont.

Council plans to instal a hydro system. Clerk, J. S. Cowan.

Flett Springs, Sask.

Telephone system, cost $22,000, for Flett Springs Telephone Co., Sec., R. R. Amber, Norwich. Contracts awarded to Northern Elec. & Mfg. Co., 599 Henry St., Winnipeg, for apparatus and to Harold Bailey, Fleet Square, for installing.

Goderich, Ont.

Electric lighting. Mayor, Chas. A. Reid. Clerk, L. L. Knox. Council contemplates installing lighting system for park and all bridges.

Montreal, Que.

Electric lighting, Pointe Claire. Engineer, V. H. Dupont, 225 St. James St., Montreal. General contractors, Laurin & Leitch, 5 Beaver Hall Square, Montreal. Sub. contractor, Mr. Cam, 3 Beaver Hall Square, Montreal.

Saskatoon, Sask.

Addition to power house, cost $13,000, for city council. Architect, T. J. O'Leary, Willoughby Summer Block. General contractor, Jas. Priel, First Ave., at

$13,008. Three storeys, 30 x 80, cement foundation, Portage la Prairie, brick construction.

Miscellaneous

Lindsay, Ont.

Fire protection system is contemplated for Canadian Boving Co.'s plant. Clerk, D. Bay.

Ottawa, Ont.

New steamer, for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Tenders will be called shortly for a new steamer for navigation on St. Lawrence River.

Toronto, Ont.

Fire apparatus, for Board of Control. Tenders received by Mayor, H. C. Hocken, until July 8th for fire hose, hook and ladder truck and motor driven combination hose wagon and chemical engine. Specifications, etc., at office of Fire Dept., 152 Adelaide west.

Vancouver, B.C.

Three gasoline launches, for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractors, The Vancouver Ship Yard, Ltd., 1877 Georgia st., will build 3 launches, 50 ft. long.

Business Notes

Balcarres, Sask.

Two storey warehouse of Forbes & Eby, Balcarres, value, $10,000, damaged to extent of $6,000.

Montreal, Que.

Sash and door factory, 228 Duvernay, owned by Sarrasin & Fils, 61 Levis St., burned. Loss, $45,000. Not decided whether to rebuild.

Laundry and factory, 43 Dorchester, owned by T. M. Morgan, 370 Wood Ave., burned, loss, $5,000. Repairs will start at once. Builder, Jos. Gilletz, 29 Duluth Ave.

Marmora, Ont.

Royal hotel building, barns, sheds and laundry, destroyed by fire. No insurance.

Oshawa, Ont.

Building occupied by Messrs. Geo. Copeland & Sons, and owned by M. Moses was destroyed by fire. Loss $5,000.

Walton, Ont.

Saw mill, owned by John McDonald, destroyed by fire.

New Companies

Beaver Realty Company, Limited, has been incorporated with a capital of $40,000 to carry on business as general contractors, to erect buildings and deal in building material, with head office at Toronto. The provisional directors are E. C. Ironside, W. J. McLarty, barristers, and Isidor Finberg, law student, all of Toronto.

The Tweed Realty, Limited, incorporated with a capital of $40,000, to carry on a general land and building business, with head office at Toronto. The provisional directors are A. S. Lown, solicitor, W, J. McWaters. gentleman, and C. R. Munro, broker, all of Toronto.

The Innisfil Telephone Company, Ltd., has been incorporated with a capital of $12,000 to carry on the general business of a telephone company, with head office at Lefroy. The provisional directors are Ebenezer Todd, W. J. Ralston, and G. C. Allan, all of the township of Innisfil, County of Simcoe, Ont.

The London Development Co., Ltd., has been incorporated with a capital of $32,500 to carry on business as a general land and building company, with head office at New Hamburg, Ont. The provisional directors are D. P. Smith, real estate broker, H. W. Schweitzer, agent of London, and Dr. R. T. Winn, of New Hamburg.

Sutherland Construction Co., Ltd., has been incorporated with a capital of $40,000, to carry on business as a land and building company, with head office at Toronto. The provisional directors are R. W. Hart, barrister, G. M. Miller, law student, and C. H. C. Leggott, accountant, all of Toronto.

Mabees, Limited, incorporated with a capital of $40,000 to erect buildings and deal in building materials and to carry on business of a general land and building company, with head office at Toronto. The provisional directors are E. W. Mabee, David McGill, real estate agents, and J. W. Payne, all of Toronto.

The Beaver Lumber Company, Ltd., has been incorporated with a capital of $75,000 to carry on business as lumbermen, saw and planing millers and manufacturers of lumber, woodenware, etc., with head office at Toronto. The provisional directors are W. J. Mitchell, Ernest Constant, W. S. Thomas and R. J. Christie, brokers, all of Toronto.

The Consolidated Stone Company

Quarries and Mills at Bedford, Indiana, and Bloomington, Indiana
Producers of Dark Hollow Buff and Blue
Hunter Buff and Blue Oolitic Limestone

Celebrated

Bedford Stone

from our quarries has been used in many of the largest public buildings, churches, etc., in the United States and Canada.
Mill blocks, sawed, planed and turned stone of every description furnished on short notice. Write for information.

General Offices
BEDFORD, Indiana
Northwest Sales Office—326 Monadnock Bldg. Chicago

Tenders Wanted

should be advertised for in the "Tenders and For Sale Department" of the CONTRACT RECORD AND ENGINEERING REVIEW. This paper is the "Tender Ad." medium of Canada and always brings bids from the reliable contractors and supply houses.

File your plans for any work on which you are inviting bids, in our offices at Toronto, Montreal, Winnipeg or Vancouver.

Contract Record
and Engineering Review
Toronto Ontario

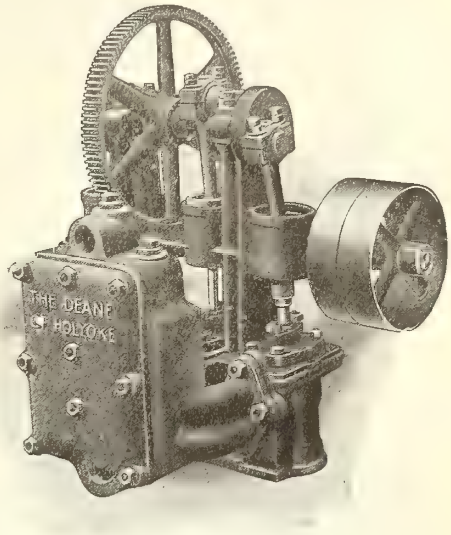
DEANE POWER PUMPS

ADMIRABLY ADAPTED FOR

HOUSE SUPPLY

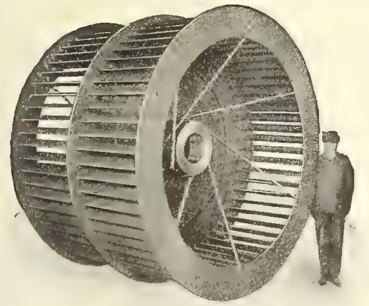
BOILER FEEDING

TANK SERVICE



THE JOHN McDOUGALL
CALEDONIAN IRON WORKS CO., LIMITED

Works: Seigneurs & William Sts., MONTREAL.
Manufacturers of Boilers, Castings, Condensers, Elevators, Engines, Filters, Forgings, Hydraulic Machinery, Pumps, centrifugal and reciprocating, Steam Turbines, Tanks, Water Wheels, Water Works Plants.



BLOWERS "Sirocco" FANS
TRADE MARK.

Made In Canada

Low cost of Installation, low cost of Operation, low cost of Maintenance, and High Efficiency are the deciding features of "Sirocco."

Engineering Service

Aside from our own Expert Engineers we have at our command the co-operation of the Engineering Service Department of the American Blower Company, and the results of years' of experience of S. C. Davidson, the inventor, Belfast, Ireland.

A "Sirocco" Fan will deliver more air with less power than the ordinary steel plate fan **twice** the size.
"Sirocco" Fans and Blowers are used in connection with apparatus for Heating, Ventilating and Cooling, in Industrial, Educational, Office and Public Buildings.
For Forced and Induced Draft under steam boilers on land and at sea.
The world's largest boats use "Sirocco" Fans for Forced Draft and Hull Ventilation.
The British Navy use "Sirocco" exclusively.

Let us tender on your next air handling problem. The services of our Engineering Department are at your command.

You Should Read "Sirocco" Bulletin No. 3401

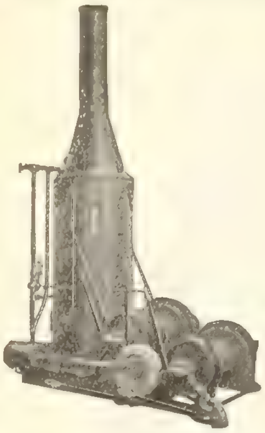
Describing and illustrating the construction, operation and application of 'Sirocco' Fans and Blowers.

Write for it today.

CANADIAN Sirocco COMPANY
LIMITED

WINDSOR, ONTARIO.

Sales Engineers:
Clark T. Morse, 301 McGill Bldg., Montreal
E. C. Powers, Room 5, 43 Victoria St., Toronto
W. P. Eddy, 214 Donald Street, Winnipeg
S. S. Clarke, 605 Second St. West, Calgary



HOISTING ENGINE REPAIRS

We carry a full line of repair parts for our hoisting machinery at all times. Prompt shipment made on anything you require.

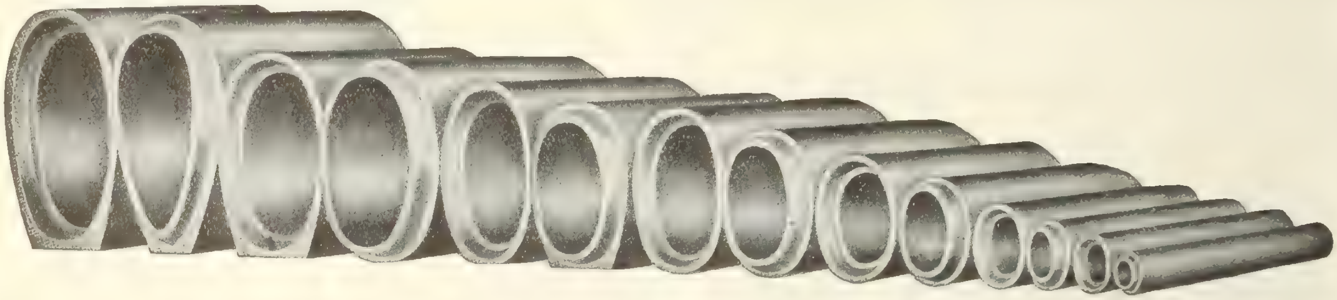
Send for Descriptive Sheet showing Parts and number to order by.

Hoists of all kinds, Winches and Derrick Irons supplied on shortest notice.

SALES AGENTS
MUSSENS
LIMITED
Montreal, Que.

MARSH & HENTHORN LTD.

Makers of Hoisting Machinery, BELLEVILLE, ONT.



Sewers and Culverts

properly built of properly made

- Reinforced Concrete Pipe -

LAST FOREVER.

OUR MATERIAL, SYSTEM and PRODUCT have been tested and approved by EMINENT ENGINEERS. NO RUST, NO ROT, NO FROST-BREAKS, NO PRESSURE-BREAKS, NO HIGH PRICES, NO DELAYS IN PROCURING, NO TROUBLE IN HANDLING.

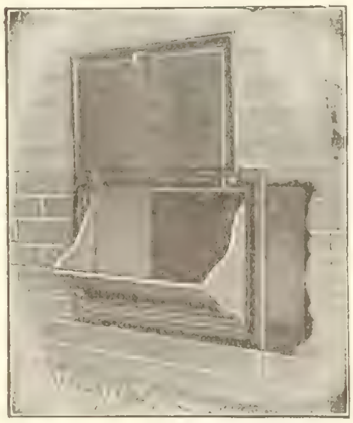
STANDARD REINFORCEMENT, or SPECIAL if required. Stock sizes 6 in. to 60 in.

Patronize Experienced and Reputable Manufacturers.

Catalogue and prices on application.

Dominion Concrete Company Ltd.

Kemptville, Ontario



EQUIP YOUR CELLAR

with one of our "Majestic" Coal Chutes which is the neatest and best equipment for any cellar. It is easily installed in either new or old houses. It permits coal, wood or vegetables to be put into the cellar without disfiguring the building in any way. And unlike a glass window it cannot be broken. The hopper can easily be removed if desired to put in very coarse coal or wood, or if a waggon chute is used. It swings back into the chute and allows the door to be closed. The door is made to lock when opened upward, and protects the wall or siding above the chute, and can be released only when closed. We make three standard sizes. There's a size that's just right for your cellar and your requirements. No. 1—22 x 16 x 13. No. 2—27 x 16 x 13. No. 3—33 x 22 x 18.

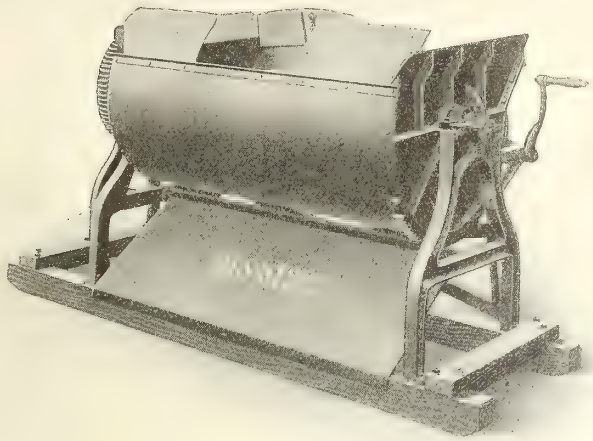
Send for our illustrated booklet, it shows and describes our full line of Coal Chutes

The Galt Stove & Furnace Co., Limited

Galt, Ontario, Can.

Montreal Representative: E. F. Dartnell, No. 8 Beaver Hall Square
Gorman, Clancey & Grindley, Agents, Calgary and Edmonton, Alberta

Time Saved in Concrete Mixing



The Blystone Skid Mixer

Every movement of this mixer is calculated to save time. The mixing is quick and thorough and the dumping, worked by the handle on the right will save moments at every batch turned out. Strongly built—all working parts carefully balanced.

The Blystone Machinery Company
61 Railroad St., CAMBRIDGE SPRINGS, Pa., U.S.A.
Full line of Blystone Mixers carried in stock by
The A. R. WILLIAMS MACHINERY COMPANY, Limited
Contractors Department No. 1, TORONTO, CAN.
Sole Distributors for Canada

"Metallic"

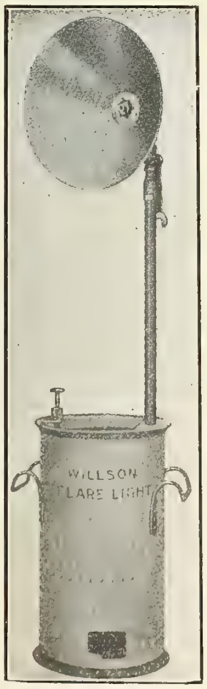
Skylights

Of all shapes and sizes, for all purposes. We can give you a better job and save you money on any skylight. Our equipment for doing this work is the most modern and complete in Canada. Write for catalogue "Z" covering Skylights, Ventilators, Cornices, etc.

Hollow Metal Construction
Plain or Wired Glass.

THE METALLIC ROOFING CO.
OF CANADA LIMITED,
TORONTO AND WINNIPEG

Contractors' Acetylene Flare Lights



Made in Two Sizes

SIZE NO 1—

8,000 Candle Power, operates 12 Hours on 18 lbs. Carbide.

Price F.O.B. Ottawa $95.00.

SIZE NO. 2—

1,000 Candle Power, operates 12 Hours on 8 lbs. Carbide.

Price F.O.B. Ottawa $65.00.

Manufactured by
International Marine Signal Co. Limited
Ottawa, Canada

FOR SALE

- 1—10 x 16 Standard Gauge Porter Locomotive
- 1—12 x 15 Waterous Slide Valve Engine
- 1—6 1-2 x 8 American D.C. D.D. Hoist with Swinger
- 1—7 x 10 Lambert D.D. Hoist
- 1—10 x 12 Beatty D.C. D.D. Hoist with Swinger
- 1—5—Ton Tandem Roller
- 1—20 H.P. Waterous Portable Boiler
- 1—30 H.P. Locomotive Boiler on Skids
- 5—Rock Drills
- 1—No. 2 Smith Concrete Mixer
- 1—No. 2 Milwaukee Concrete Mixer
- 1—15 H.P. Upright Boiler

The above machines are but slightly used and are in good working order.

Fleming Machinery Company
340 Sparks Street, Ottawa, Ont.

"Luxfer" means Daylight

Both Literally and Practically

Translate "Luxfer" into simple English and it means to throw daylight. Install "Luxfer" in any dark building where daylight is wanted and you get daylight thrown were you want lots of it every day and all day long without any cost after the initial outlay.

The Luxfer Prism was the first and best prism on the market and despite its competitors who have come and gone, "Luxfer" is still supreme.

Always specify Luxfer and you will always get daylight.

LUXFER PRISM COMPANY, Limited
100 King Street West, TORONTO

Storage Houses Oil Houses

¶ We have the best possible facility for making all kinds of storage houses of one storey, no matter of what dimensions.

¶ We will undertake to furnish and erect such buildings complete ready for occupancy.

¶ No steel building is too small or too large for us to figure on.

¶ We shall be pleased to furnish estimates and sketches on this class of work at any time. Write us and tell us what you need and we will prepare estimates for you at once.

Cut shows an all-steel building used for storing expensive patterns and dies. The size of this is 18′ x 39′ and it has been doing service for years and gives the same good service as when erected.

The Metal Shingle & Siding Company, Ltd.

Associated with
The A. B. Ormsby Company, Limited

Montreal, Toronto, Preston, Winnipeg,
Saskatoon, Edmonton, Calgary.

Trinidad Liquid Asphalt | **Bermudez Road Asphalt** | **Trinidad Lake Asphalt**

Bermudez Road Asphalt

Certainty of results is one of the great advantages of using Bermudez Road Asphalt, the only *lake* asphalt macadam binder.

Good roads have been and will be constructed with other materials—but you never can tell when.

This is not merely an assertion by parties in interest—it is the teaching of the past three years' experience in bituminous macadam road building.

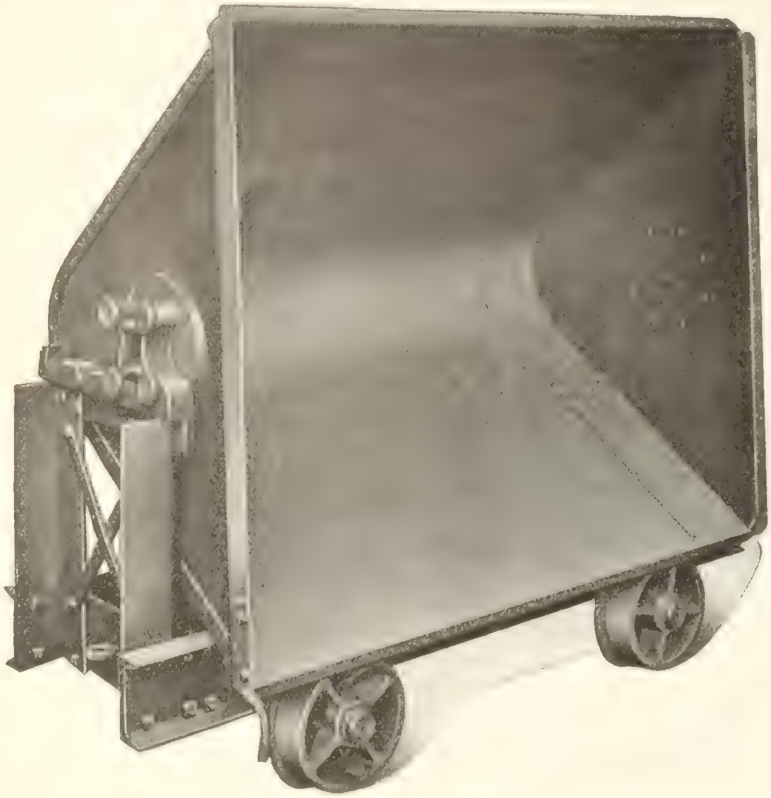
This fact was recognized by the chief engineer of one of our most advanced highway commissions, who said in a recent public discussion: "While natural asphalts are preferable, yet petroleum-residue oils may be used with success."

Why take chances? There is no more uncertainty about Bermudez Road Asphalt than there is about the action of a standard Portland cement.

The reasons for the greater certainty of results in the construction of permanent country roads, town streets, and city boulevards with Bermudez Road Asphalt, are told in the Bermudez Road Book, of which we shall be glad to send you a copy.

The Barber Asphalt Paving Co.

Philadelphia, Penn.



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Steel Dump Cars

Simplest, Strongest, Best

We make 'em in any size or gauge

We also make Winding Drums and Portable Track

Bechtels Limited Waterloo, Ont.

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SEAMLESS and LAPWELDED
STEEL TUBES
for
Waterworks, Hydro-Electric and Gas Mains,
Well Boring Tubes,
Traction, Trolley and Transmission Poles,
Boiler Tubes and Superheater Tubes.

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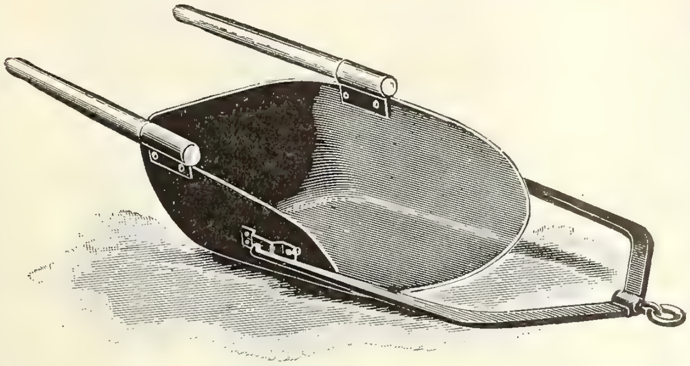
The Best Value for Your Money



IN CONTRACTORS' SUPPLIES

Our DRAG SCRAPERS have pressed bowls of high carbon steel—all joints and seams being eliminated. They are stiff and serviceable. WHEEL SCRAPERS can be supplied with either square pan or pressed bowl, and have the latest and most approved dumping attachments.

Always order by the name—

IRON AGE

Our STEEL TRAY BARROWS with trays pressed from solid sheets of high carbon steel, without seams or joints, are the standard with all the leading contractors.

Remember we make Pick and Rooter Ploughs to satisfy the most exacting conditions.

Catalogue will be sent free on request.

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340 CAMPBELL AVE., TORONTO

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You Pay for Good Wire

whether you use it or not. If you buy a cheap wire, "made to meet a price," you may pay several times the cost of good wire in replacement of your wiring or of the building in which it is installed.

"Sterling" Rubber Insulated Wire

is made to maintain a standard, not to meet a price. The price, however, is as low as that for which a product of equal quality can be sold.

Our new booklet, "**Sterling,**" *gives valuable information about rubber covered wire. Sent on request.*

Standard Underground Cable Co., of Canada, Limited

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Manufacturers of Electric Wires and Cables of all kinds, all sizes, for all purposes, also Cable Terminals and Junction Boxes, etc.

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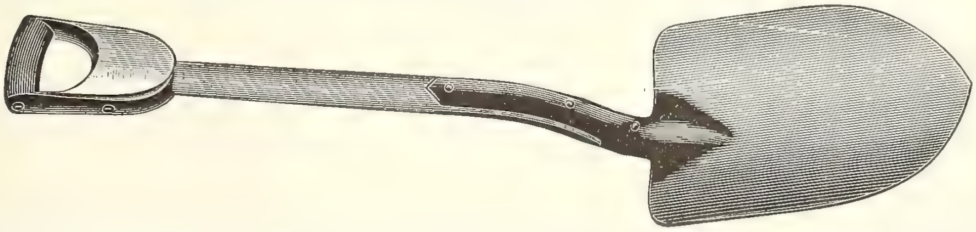
LUNDY SHOVELS

For Railroad and Municipal Contractors

Are known from coast to coast for their strong construction and durability, and are in use on the largest construction works in the country.

Only the very best materials enter into their manufacture and our trade mark stamped on every shovel is a positive guarantee that goods are as represented.

Our Round Point Socket Strap Plain Black Shovel



The Shovel That Stands The Test

We will send to any contractor, free, express prepaid, upon request, a sample shovel, which will speak for itself. Send also for our illustrated catalogue, showing our full line of Shovels, Spades, Scoops, Draining Tools, etc.

Carried in stock by all leading wholesalers, or direct from the manufacturers

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Color cards free for the asking

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Nova Scotia Steel & Coal Company, Ltd.

Beg To Announce

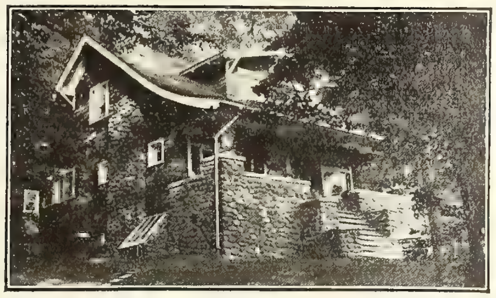
That their new steam-hydraulic forge shop is now in operation, as also is their recently installed "Harmet" fluid compression-plant.

These improvements bring "Scotia's" equipment abreast of the best foreign forges.

They are accordingly open to supply forgings of all shapes and sizes. Made of ordinary or fluid compressed open-hearth steel, and satisfying the most severe specifications.

For Prices and Particulars Apply to

Head Office - - New Glasgow, N. S.



S. M. Underhill's Bungalow, Stained with Cabot's Creosote Stains and lined with Cabot's Quilt. Designed and built by Tracy L. Freeman, Nyack, N. Y.

"Cabot's Stains are the **only** Stains I use when I get up the specifications, and if I build where other's specifications call for other stains I try and get them over to Cabot's for I know the results are better for all concerned." TRACY L. FREEMAN.

THE ONLY REAL STAINS

If you have only seen the crude and tawdry colors of the thinned-paint imitations of

CABOT'S SHINGLE STAINS

you have no idea of the beautiful coloring effects of the true Stains. They are soft and deep, like velvet, but transparent, bringing out the beauty of the wood grain. Half as expensive as paint, twice as handsome, and the only Stains made of Creosote, "the best wood preservative known."

CABOT'S "QUILT" **Cold-Proof, Heat-Proof, Sound-Proof, 40 Times Warmer than Common Papers.**

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With our 9 Branch yards situated as they are we are prepared to guarantee a prompt delivery service of any orders you may favor us with and would ask you to give us a trial in order that we might prove same to you and also prove the excellence of our material.

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Crown Office Building, Toronto, Ont.

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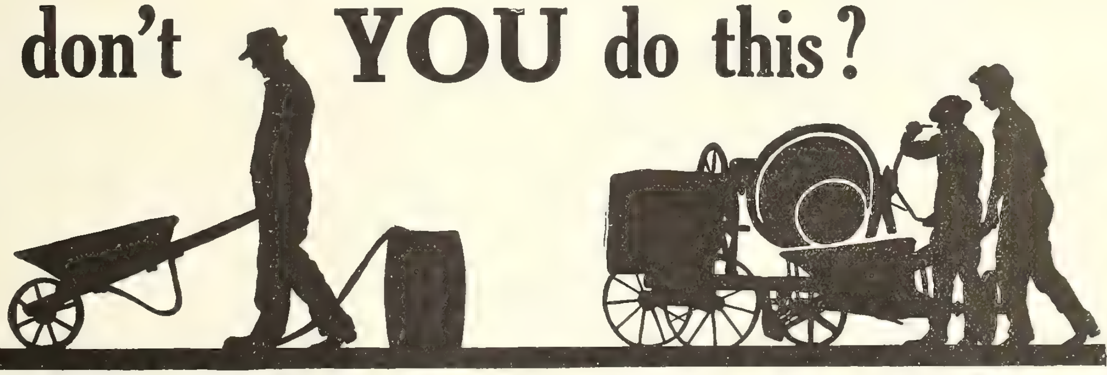


PAID FOR ITSELF IN ONE MONTH

Peterson, Iowa, Jan. 29, 1912.

I first saw one of your LITTLE WONDERS working at Everly, Iowa, and it looked so good to me that I bought a machine at once.

My LITTLE WONDER "FIVE" paid for itself in just one month. I have worked around several different mixers, and the LITTLE WONDER "FIVE" has them all beaten.

W. J. JOHNSON, Contractor and Builder.

LITTLE WONDER "FIVE"

"The Small Job Money-Maker"

You can make more money with this Concrete Mixer than with many of larger capacity and greater cost. Mixes 35 to 50 cu. yds. per day on one gallon of gasoline—many contractors far exceed this. Saves 50 cents per cu. yd. over hand work.

TEN DAYS' FREE TRIAL

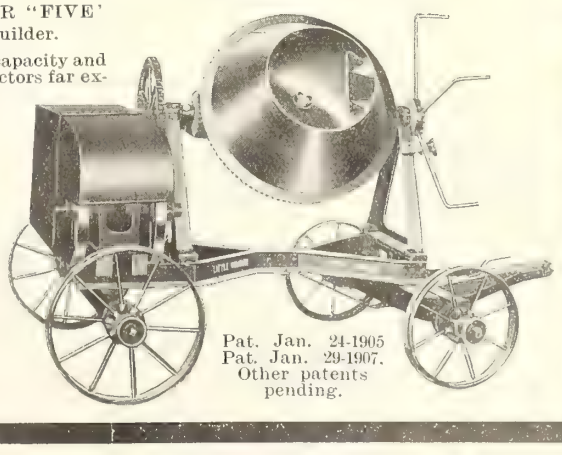
and our "Man to Man" proposition for payments make this the best "buy" ever known in mixers for small work. Thousands of contractors in the States are doubling their profits with it—why not you?

If you want a machine for heavy work look into our WONDER "TEN"—capacity 10 cu. ft., or 1/3 yd. "Sack to the batch." Same FREE TRIAL, same liberal terms.

Send for our "Man to Man" proposition NOW, while you are thinking about it.

CANADIAN REPRESENTATIVES WANTED

WATERLOO CEMENT MACH'Y CORP'N
117 Vinton St., WATERLOO, IOWA



Pat. Jan. 24-1905
Pat. Jan. 29-1907.
Other patents pending.

Standard Supply
& Equipment Co.,
1710-12 Market St.,
Philadelphia, Pa.

Gentlemen:—

We purchased from you a Chain Belt Concrete Mixer on April 18th, 1912. This concrete mixer has been in continual service up to the present writing and will say at no time has this machine caused us one minute's delay and I can thoroughly recommend this machine for thorough, efficient and prompt service to anyone who wishes, in my opinion, the best concrete mixer on the market.

Very truly yours,

Pier Realty & Holding
Company

Samuel H. Headley
Supt. of General Construction

Mr. Headley is a contractor of prominence as might be supposed from the character of the work illustrated. His opinion is "worth while."

The Builder of the $500,000 Concrete Pier at Atlantic City Considers the

Chain Belt Mixer

"THE MIXER WITH THE BULGE."

The Best Concrete Mixer on the Market

THE mixer was placed in service on the pier project and how well it did the work is shown by the foregoing testimonial.

Work of this character is pretty good evidence of the capacity and efficiency of a concrete mixer. The pier in question extends more than a third of a mile out to sea. The construction, therefore, must be of the most substantial kind. The concrete must be of high grade and of uniform quality. The Chain Belt Mixer was the mixer selected to produce it.

The work must be rapid. The Chain Belt Mixer is one of the lighest-running and fastest machines built. It therefore met that requirement.

There must be no interruptions due to breakdowns, etc. Chain Belt Drive and the Chain Belt Mixer constructions generally are the best possible assurance against breakdowns and loss of time. Hence, the Chain Belt selection on those grounds.

The season will be in full swing almost before you know it. Better order that Chain Belt Mixer now. What size do you require?

CHAIN BELT COMPANY

MILWAUKEE, WISCONSIN

Dominion Equipment & Supply Company,
Winnipeg, Manitoba, and Vancouver, B. C.

Atlantic City Pier in Course of Construction. Completed, it will have cost $500,000. It will extend 2,000 feet seaward and is being constructed almost entirely of reinforced concrete. Samuel H. Headley, Contractor. Chain Belt Mixer used.

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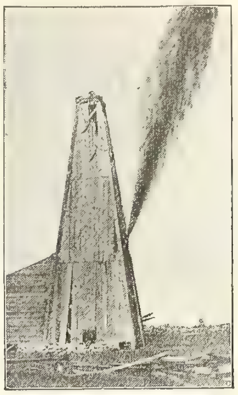
Sole owners of the B. M. patent process of lumber preserving.

British Method Best Method



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Wells drilled to any depths up to 5,000 feet and any size diameter. Contracts taken in any part of Canada. Estimates furnished. Excellent references. Water Wells drilled by us are supplying towns and villages with clear, pure water all over Canada.

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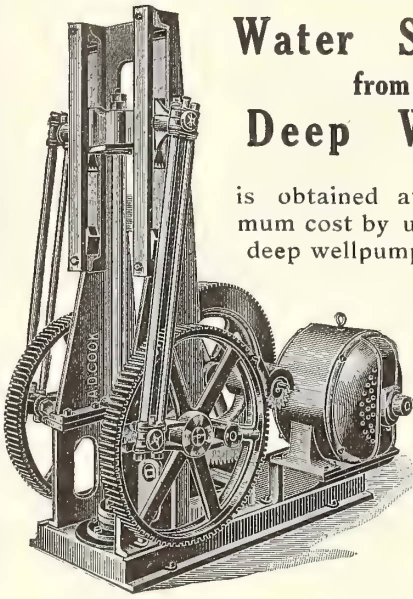

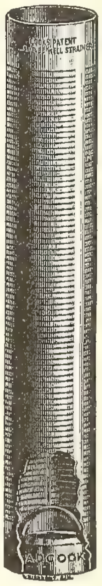

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is obtained at a minimum cost by use of our deep wellpumps.

Write for Bulletin 26 explaining the use of Cook's Patent Brass Tube Well Strainer

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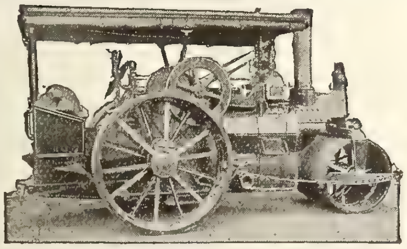

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Tandem and Macadam.

Based on 20 years' experience.

All sizes.

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We solicit an opportunity to tender on any work in the above lines

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McKiernan-Terry Core Drills

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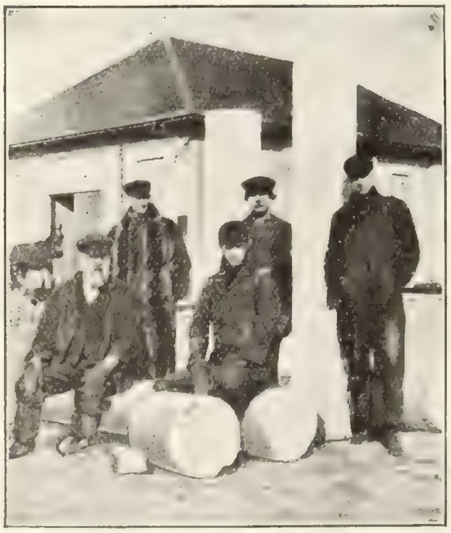

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The 16 in. hard limestone cores shown above were taken out by one of our Type "C" McKiernan-Terry core drills, operated by the Corporation of Winnipeg.
This Drill is capable of boring any size holes up to 30 ins. in diameter.

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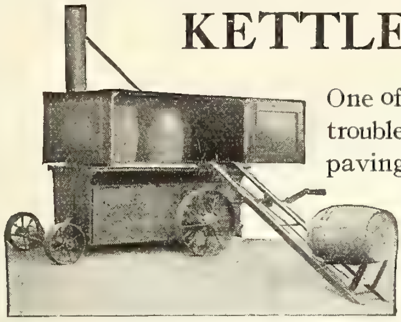

One of a complete line of trouble-proof, long-service paving and road-making tools and machinery. Steam rollers.

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of all types and sizes, Heaters, Tanks, Pumps, etc.

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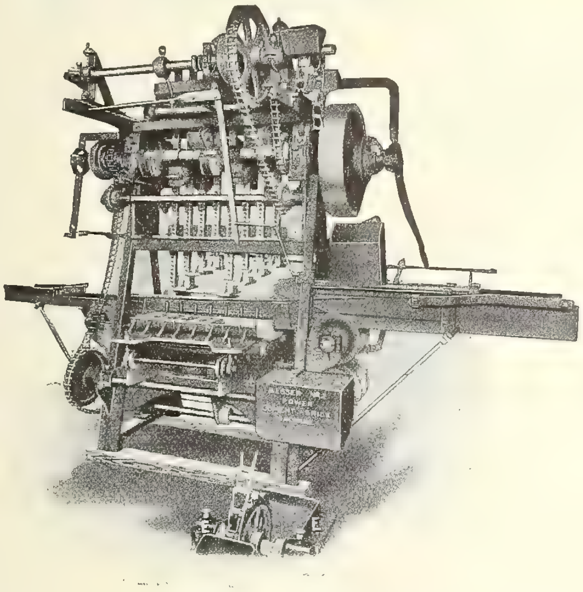
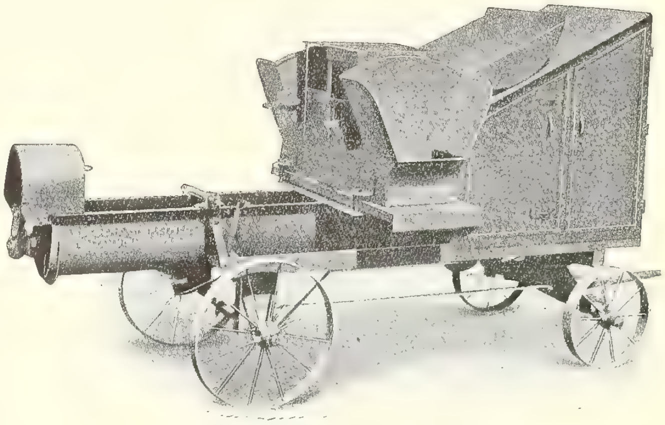
Cement Bricks

Here are the two Besser machines that make the best cement brick on the market. The Brick machine that will make 30,000 bricks per day—every brick the same.



Besser Power Cement Brick Machine



Besser Simplified Continuous Mixer

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WOODSTOCK, ONTARIO

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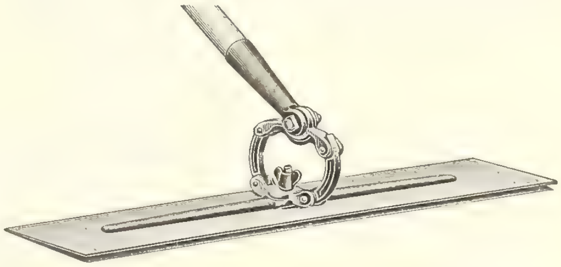

"Abram" Sidewalk Finishing Tools are sold on the **Guarantee** that **ONE MAN** can do more work with them than **THREE MEN** can do with ordinary tools. This means, if Finishers get $4.00 per day, you save the wages of **TWO MEN**, or $8.00 per day, by using **"Abram"** Tools. We positively guarantee this result. Let us prove it to you. Circular.

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and all sizes of Drain Tile and Cement Brick.
Write for Prices
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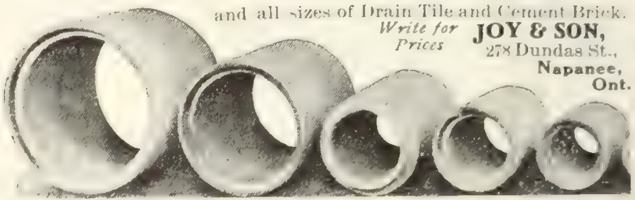

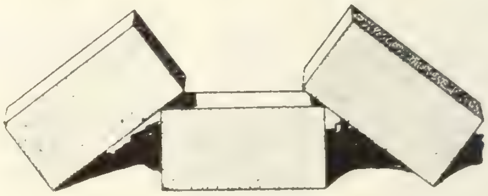

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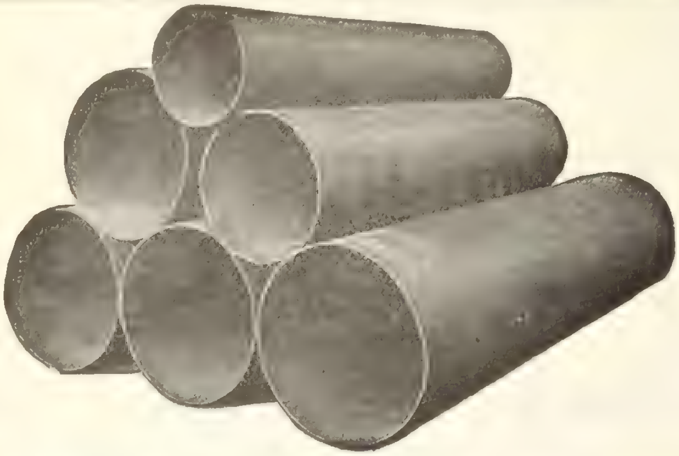

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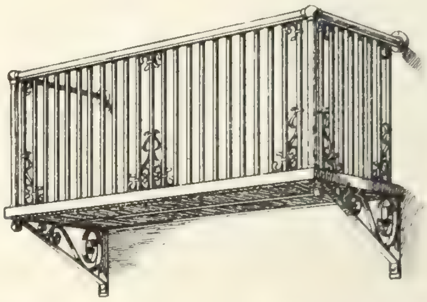

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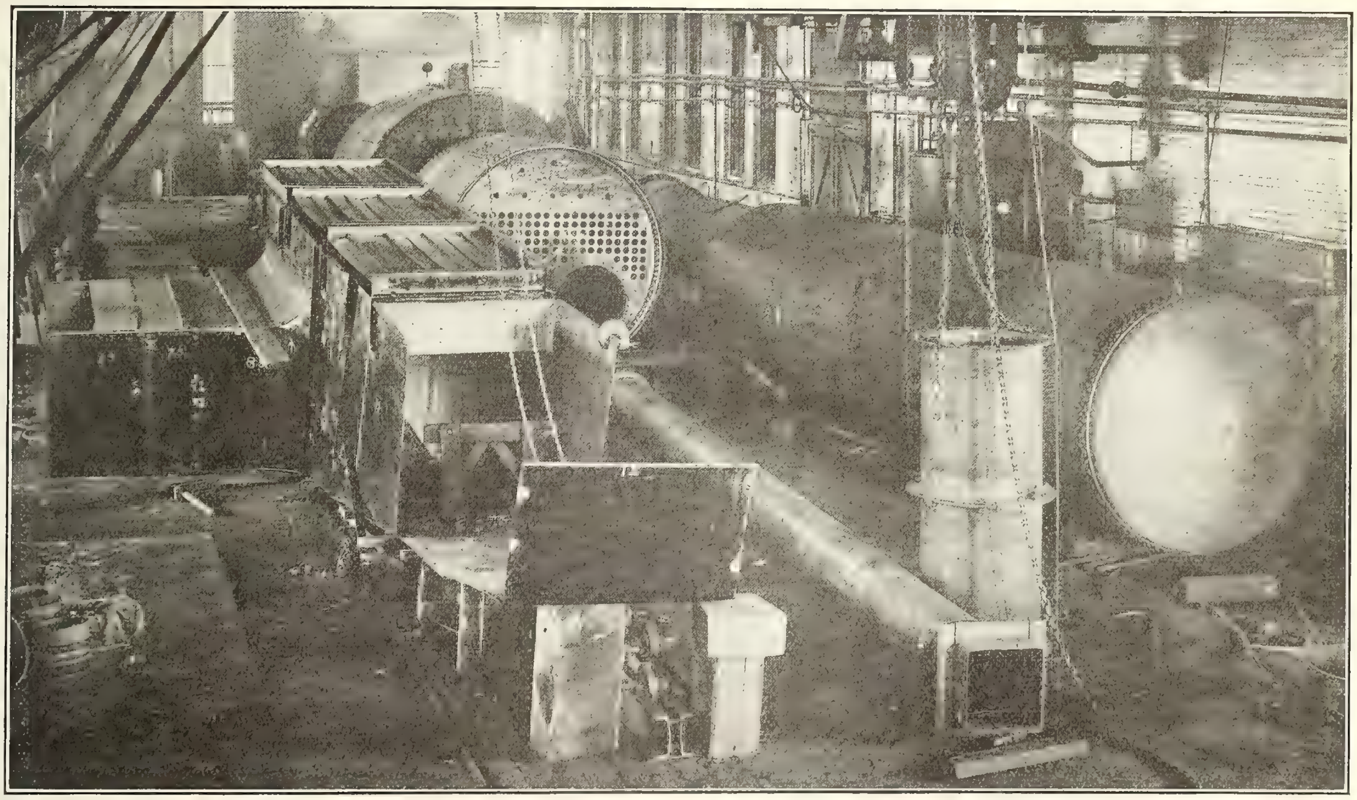

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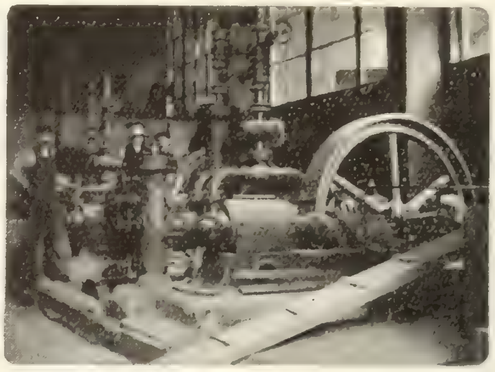

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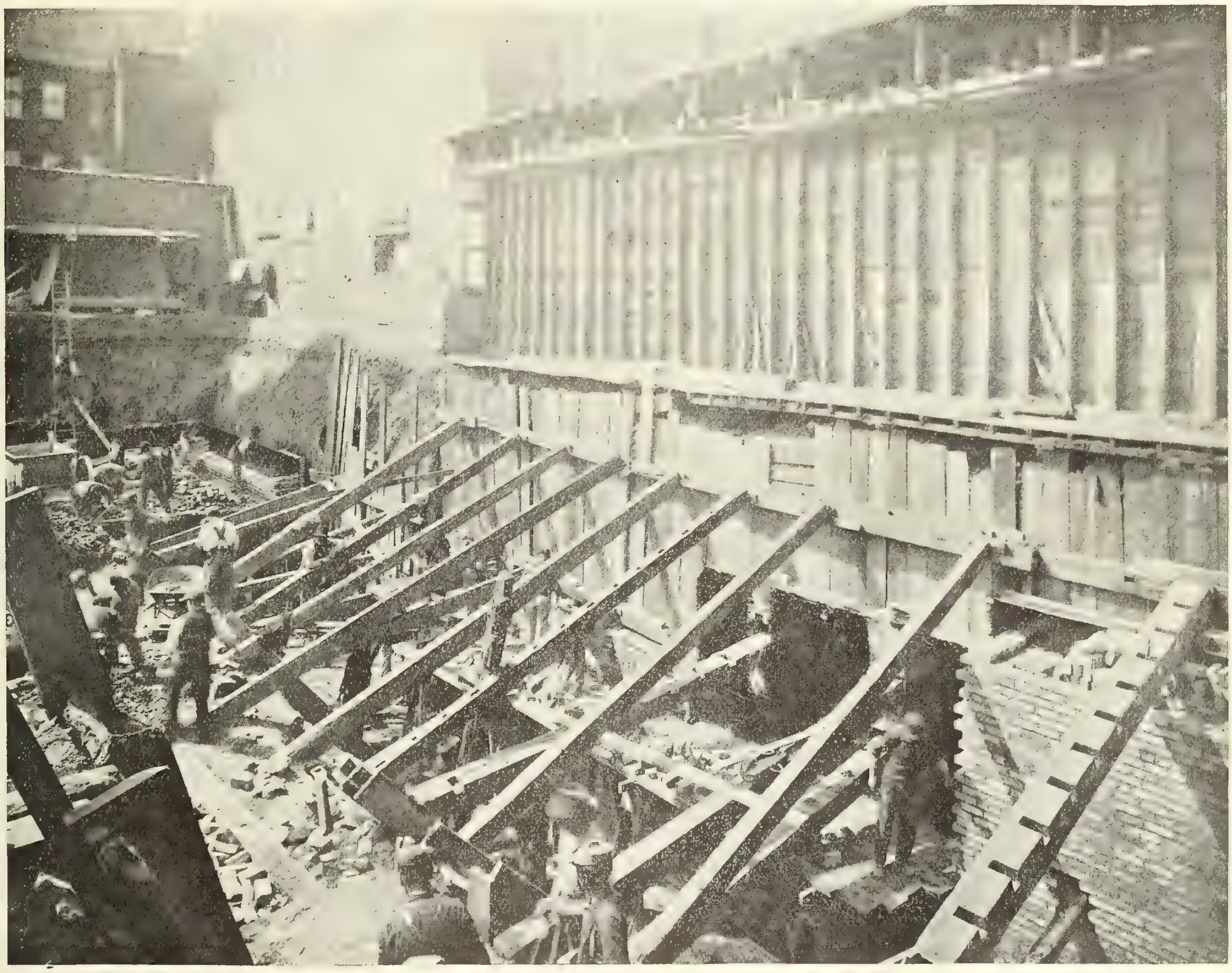

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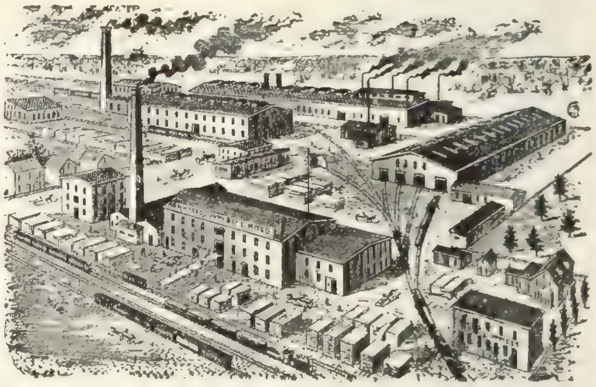

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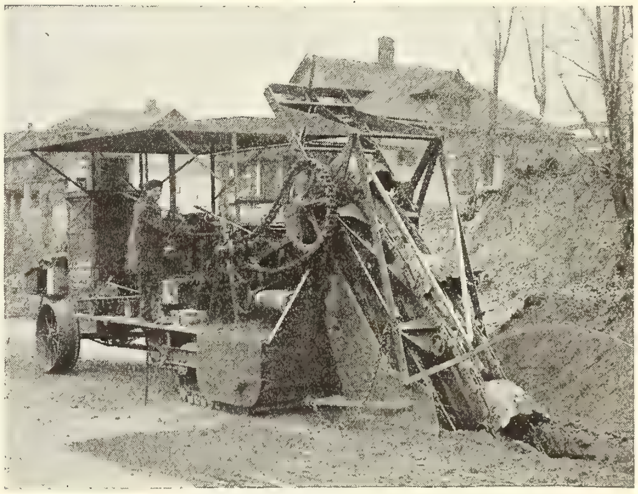

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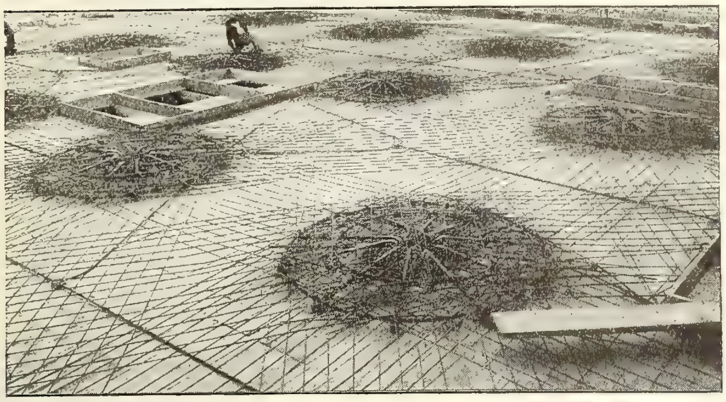

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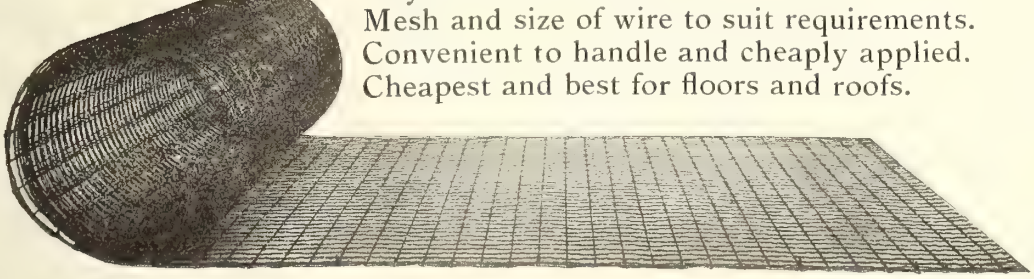

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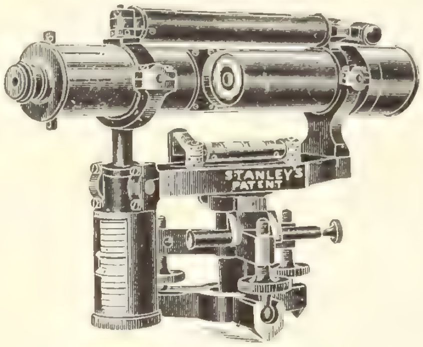

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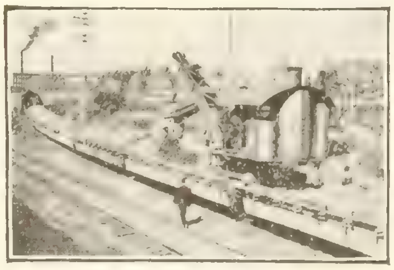

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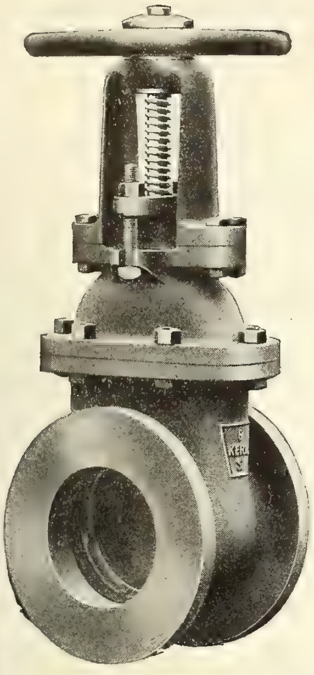

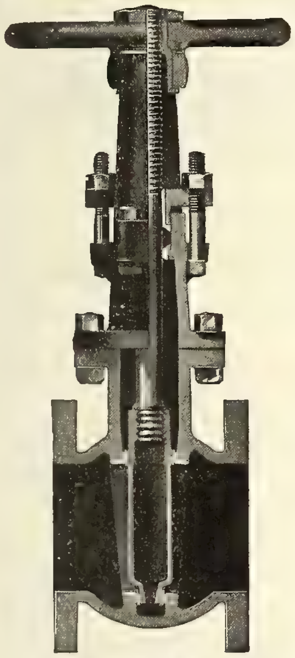

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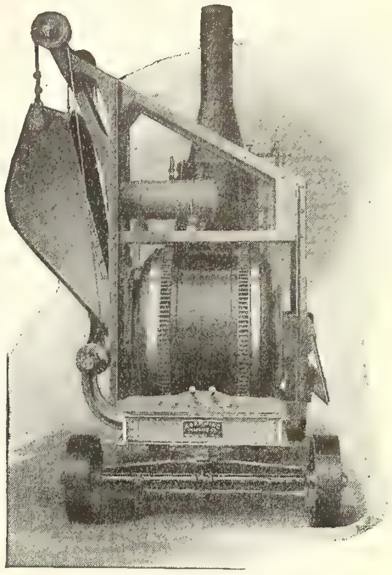

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LIMITED—Toronto, Montreal, Halifax, Ottawa, Cobalt
Winnipeg, Calgary, Vancouver, Nelson.

Current Prices of Building Material.

BRICKS

The following are wholesale prices delivered at Toronto:—

	Per M
No. 1 dry pressed red brick	$18 00
No. 1 dry pressed buff brick	18 00
Red Stock Bricks	13 00
Grey Stock Bricks	13 00
Wire cut bricks for foundation work ...	12 50
Porous terra cotta bricks	15 00
No. 1 enamelled bricks, all colors, from	$80 00 to $150 00

LUMBER (Building Material)

Hemlock Lumber—

2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$27 00	
2 x 4 to 2 x 12, 16 ft.	27 00	
2 x 4 to 2 x 12, 18 ft.	26 00	30 00
1 in. Hemlock, No. 1	26 00	28 00
No. 1 Hemlock Decking	24 00	28 00
No. 2 Hemlock dimension and 1-in.	20 00	22 00

Pine -

1 in. common pine 8 to 12 in. wide rough	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
⅞ x 8 and 10 in. pine shelving..	36 00	42 00
⅞ x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine desking D2S	30 00	
Spruce Decking	28 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

Pine trim for paint finish—

4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8-in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

Shingles—

XXX B. C. Clear Shingles, per M.	3 90
N. B. Extras	3 75
N. B. Clears	3 10
No. 1 pine lath, per M.	5 00
No. 2 pine lath	4 50
No. 1 spruce lath	4 00

Cedar Posts—Fence—

5 in. at small end, each	30
7 in. at small end, each	35
Hemlock lath	3 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

	Star	D.D.
10 to 25 united inches	$4 25	$ 6 25
26 to 40 "	4 60	6 75
41 to 50 "	5 10	7 50
51 to 60 "	5 35	8 50
61 to 70 "	5 75	9 75
71 to 80 "	6 25	11 00
81 to 85 "	7 00	12 50
86 to 90 "		15 00
91 to 95 "		17 50
96 to 100 "		20 50
101 to 105 "		24 00
106 to 110 "		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for box lots:—

MONTREAL

	Star	D.D.
25	$3 25	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
90		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 u.i.	$3 50	$5 00
26/40	3 75	5 50
41/50	4 25	6 25
51/60	4 75	7 00
61/70		8 00
71/80		9 00
81/85		10 00
86/90		11 00
91/95		13 00
96/100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

STEAM FITTERS' AND PLUMBERS' SUPPLIES

Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock ...... net $1.85

No. 4½ Fuller's .... net $2.50

Square head brass cocks, 65 per cent.

Lead Pipe

Lead pipe, $7.50, less 10 per cent.; lead waste, $9.00, less 10 per cent.; caulking lead, 6¾ cents per lb.; traps and bends, 35 per cent.; pig lead, 5¾ cents per lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.28	¼ inch	$3.18
⅜ "	2.28	⅜ "	3.18
½ "	2.72	½ "	3.57
¾ "	3.28	¾ "	4.43
1 "	4.85	1 "	6.55
1¼ "	6.56	1¼ "	8.86
1½ "	7.84	1½ "	10.59
2 "	10.55	2 "	14.25
2½ "	16.67	2½ "	22.52
3 "	21.80	3 "	29.45

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

Soil Pipe and Fittings

Medium and extra heavy pipe and fittings, up to 6-inch, 60 and 5 per cent.

7 and 8-inch pipe, 45 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

CEMENT, STONE, STEEL, Etc.

Cement, barrel lots, in bags, delivered, Toronto, bags extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ⅜-inch, $1.45.

Burnt River rubble stone delivered, $17 to $18 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¾ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

Free stone delivered, $17 to $18 per toise.

Brown coursing stone, delivered, $3.75 per yard.

Grey coursing stone, delivered, $2.50 to $2.75 per yard.

Sand, for cement or brick work, $1.15 a cubic yard, f.o.b. Toronto, C. P. R. sidings.

Sand, for cement or brick work, 90c to $1.05 a cubic yard, f.o.b. Toronto, G. T. R. sidings.

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

Steel channels and beams, $2.65 to $3.00 per 100 pounds, delivered f.o.b. Toronto.

Hard Wall Plaster, unsanded, $8.50, bags extra; sanded, $4.50 in car lots; hydrated lime, 9.00 in car lots.

Lime per cwt., delivered, not less than 1,500 lbs. 33 cents; white, 43 cents.

Plaster of Paris, Anchor Brand, $1.50.

Manilla Rope, best, per pound, 12½ cents.

PAINT AND OILS

Pure White Lead, ground in oil, $8.50 per 100 lbs.

Boiled Linseed Oil, in bbls., 63c. per gal. of 9 lbs.

Raw Linseed Oil, in bbls., 60c. per gal. of 9 lbs.

Turpentine, in barrels, 60c. per gallon.

Pure Red Lead, dry $6.50 to $7.50 per 100 lbs.

Putty, pure linseed oil, in bulk, bbls., 3½c.

Putty, pure linseed oil, in 25-lb. tins, 4c.

Geo. M. Miller & Co.

Architects

Toronto General Trust Building TORONTO

Power & Son,

Architects and Building Surveyors

Merchants Bank Chambers,

Kingston, Canada

Established 1882

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The Weekly Financial, Commercial & General Trade Newspaper of the Great West.

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Greensville - - Ont.

Driller of Oil, Gas, Salt or Artesian Wells

Deep Wells a Specialty

20 Years' Experience in Canadian Oil Field

Contracts taken in any part of Canada. Several years' experience in Artesian Wells for Municipal Water Works. Estimates or geological information cheerfully furnished. **References Given.**

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Heating Problems

for next Winter

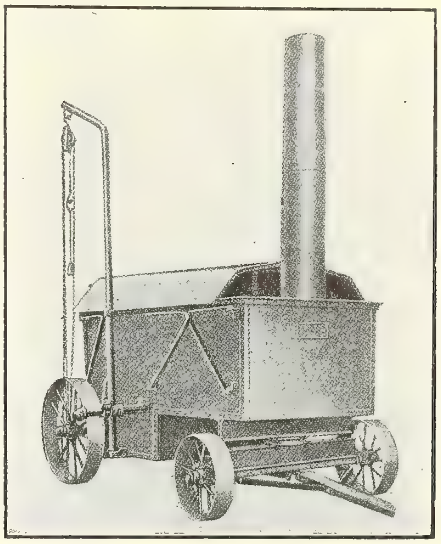
and it's better to have them all settled ahead of the coming of cold weather. We make a specialty of matching heating systems to suit conditions. So, if you are installing new plant or want more efficiency from your present outfit

CONSULT

Dietrich
LIMITED

300 Read Building - Montreal

Tank will heat to 400 degrees
Heaviest Binder in any weather
in less than one hour.



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SHIPPED
SAME
DAY
AS
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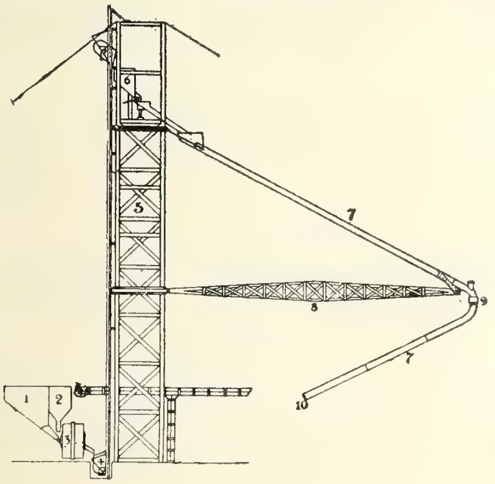
TO LAST

MADE IN TWO SIZES

Stevenson & Leonard Machine Co.
Albany, N. Y.



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Distributing Concrete

A system that improves the concrete and reduces the cost.

Information gladly furnished and Estimates given on any work.

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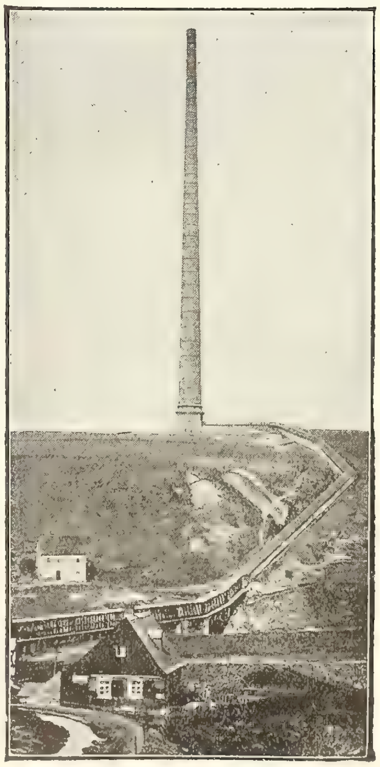
Eastern Representatives—
STINSON REEB BUILDERS' SUPPLY CO., LTD., MONTREAL, P.Q.



460 feet x 8 feet 2 in.

World's Largest Chimney

Radial Brick chimneys are the only type that will not deteriorate from the effects of gases and erosion.

HEINICKE CHIMNEYS

will be found proving their superiority to over 4,000 users in every part of the country. The day of common brick and metal stacks is gone—if you are building a chimney make it a **HEINICKE.**

Write for catalogue

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Representatives for Canada:
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Dartnell, Ltd., Montreal, Que.

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WATER WORKS CONTRACTORS

MANUFACTURERS OF

WOODEN WATER PIPE

For water works systems, domestic water supply and hydraulic mining. Insulated wire conduits; steam pipe casings; acid-proof pipe for mines, tanneries and pulp mills. Sizes from 2 inches to 24 inches.

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Limited

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STEEL MERCHANTS
AND
MANUFACTURERS AND CONTRACTORS FOR

Steel Railway and Highway Bridges, Steel Frame and Mill Buildings, Structural Steel and Plate Work of any description.

Capacity 9000 tons per annum.

Shop is equipped with High Speed Electric Cranes and Modern Heavy Duty Tools, Can handle single pieces structural work of 40 tons.

Large Stock of Beams, Channels, Angles, Tees, Plates, etc., for prompt shipment.

Stock yard runway 800-ft. long, crane 70-ft. span.

Shipping runway 400-feet long, crane 80-ft. span.

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Spadina Avenue Dock
TORONTO

AYR
Ontario

Water Washed Sand
Pit Sand
Screened Gravel
Pit Run
Crushed Limestone
Crushed Granite

OUR plants at AYR and TORONTO are the most modern in the country and our materials are the best that can be produced.

Call Adel. 1947 and we will be pleased to give you all information regarding prices and deliveries.

JAMES THOMSON, President. J. G. ALLAN Vice-President. JAMES A. THOMSON, Secretary.

THE GARTSHORE-THOMSON PIPE & FOUNDRY CO.

LIMITED

Manufacturers

Flexible and Flange Pipe, Special Castings and all kinds of Waterworks Supplies.

3 inches to 60 inches diameter

for Water, Gas, Culvert and Sewer

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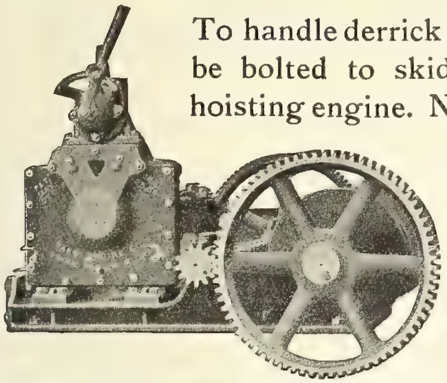
The Canada Iron Corporation, Limited

Head Office:
Mark Fisher Building
MONTREAL

Iron Ore, Pig Iron, Car Wheels, Cast Iron Water and Gas Pipe, Specials, Valves, Hydrants, etc., Castings of all kinds, Mooring Bollards for both Concrete and Wooden Docks, Hoisting Machinery.

The Dake Swinging Gear



To handle derrick booms. Can be bolted to skids in front of hoisting engine. No dead center.

Start, Stop, Reverse at Will

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Dake Engine Co.
Grand Haven, Mich.

When you want stone that appeals specify

"Queenston Blue" Limestone

Send us your specifications for Cut Stone work

The Queenston Quarry Co., Ltd.
ST. DAVIDS, ONT.

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The Ready Mixed
Hard Wall Plaster

Manufactured by

Alex. Bremner
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"Galvaduct" and "Loricated"

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for Interior Construction

Conduits Company, Limited
Sole Manufacturers under Canadian and U. S. Letters Patent
Toronto - Canada

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LARGEST MANUFACTURERS IN CANADA OF

every size for Water, Gas, Culvert or Sewer, Carried in Stock

Lake or Rail Shipments Offices, Works and Docks, TORONTO

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Lime, Stone, Cement, Sewer Pipe, Fire Brick, Weeping Tile, Mortar Colors, Plaster, &c.

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RAILS New and Relaying Switches, Turntables, Etc.

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Jno. J. Gartshore, Toronto

"EBANO" and "EAGLE" Brands

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HERKIMER ST., HAMILTON. Paved with our Mexican Asphalt.

Write for analysis and samples

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Sole Canadian Agents for the Mexican Eagle Oil Co.
Also Agents for MASTIC ASPHALT for Sidewalks.

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It is easy to obtain with our plants and apparatus

We design and contract for complete municipal filtration plants of any capacity.

We supply and install apparatus for sterilizing water supplies by the application of calcium hypochlorite.

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1001 Chestnut St., PHILADELPHIA, Pa.

We have no affiliations or working acquirements with any of our competitors.

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J. & J. Taylor

Toronto Safe Works

Established 1855 **TORONTO**

Branches: Vancouver and Winnipeg
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A few dollars spent in advertising your proposals in the

Contract Record
and Engineering Review

would result in additional competition, which might save your city or town or your client many hundreds of dollars.

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Welded or Rivetted
WITH ANY TYPE OF JOINT
AND FOR ALL PURPOSES
GAS, WATER, SEWAGE, STEAM, Etc.
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Thomas Piggott & Co., Ltd.
Cables:
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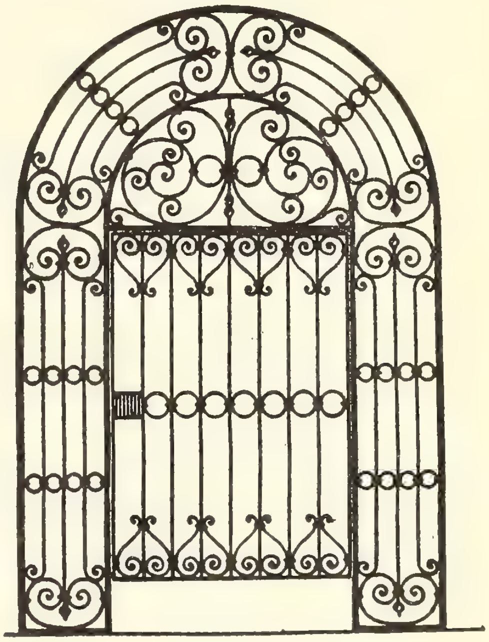
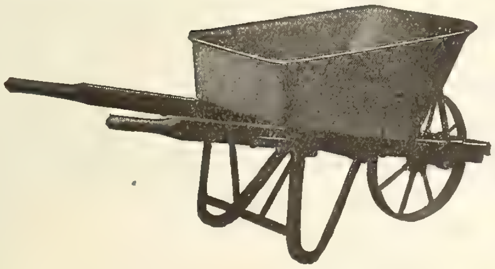
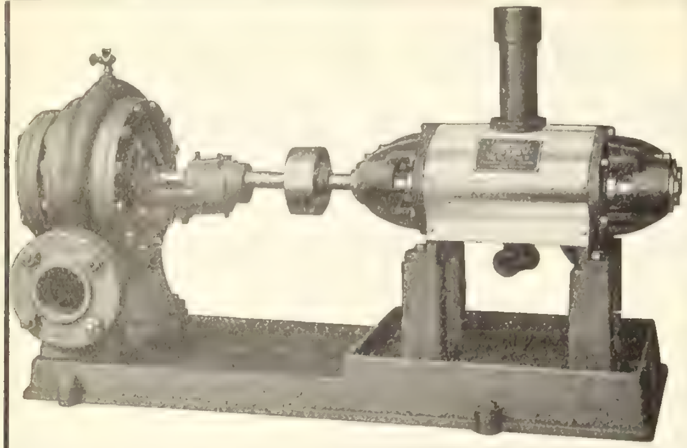




"Bull Frog" Wheelbarrows
and
Concrete Carts
of all descriptions

Are you satisfied with your wheelbarrows, if not you can purchase the "Bull Frog" brand from Dominion Equipment & Supply Co. of Winnipeg, London Concrete Machinery Co., Ltd., London, Ont. and E. P. Jamison & Co., Ltd., of Vancouver, and be assured of satisfaction.

THE TOLEDO WHEELBARROW COMPANY, TOLEDO, O., U.S.A.



The new factor in Pumping Cost.

The remarkable performance of the Spiro turbine as applied to centrifugal pump drive, merely proves the old truth about the cardinal virtue of simplicity.

A gas producer yields a horsepower from the smallest quantity of coal, yet a steam operated Spiro-Centrifugal pumps a gallon of water at a much smaller total cost, figuring attendance, depreciation, investment and fuel combined.

Over and above this, the Spiro-Centrifugal has set up a new standard in continuity of operation, and by its almost total absence of repair cost.

"Buffalo" SPIRO-CENTRIFUGAL PUMPS

No one dreamed that a pair of plain herring-bone gears could be made into an engine or turbine before the advent of the Spiro. This new principle is revolutionary and has reduced prime mover construction to what would seem the limit of simplicity, service and economy combined. Not a single blade, nozzle or valve in the entire unit. Just a pair of herring-bone gears enclosed in a cylinder, with a jet of steam blown against them.

Ask for new 84-page catalog No. 225, and investigate the wonderful adaptability of the Spiro for direct connection to Pumps, Fans, Generators and machinery used in mining, quarrying and other pursuits.

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Sole Canadian Agents—

CANADIAN BUFFALO FORGE CO.
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Structural Water-proofing

"DEHYDRATINE"

For Water-proofing under the membranous method.

"HYDRATITE"

For Water-proofing Concrete.

"FERRO FAX"

For Surface Hardening Concrete Floors.

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A Cement Coating—Makes Surfaces Water Shedding.

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"These Trade Names protect you against the possible selection of inferior materials. Whether you prefer a water-proof paint or a compound, we can give you satisfactory assurance as to the reliability of these products."

"FOR 15 YEARS STANDARD OF THEIR KIND."

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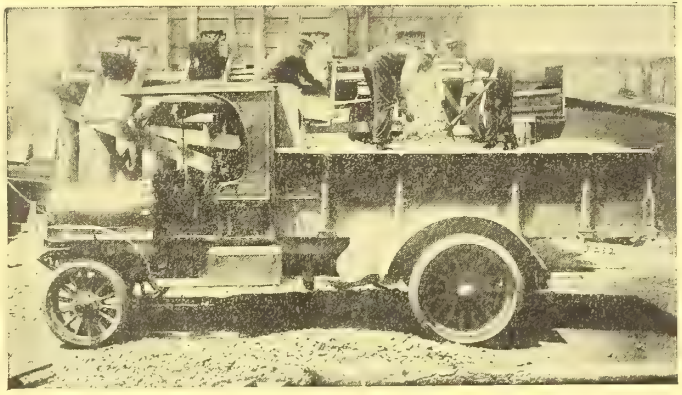
Think of a Truck Saving $43 a Day Over Horses!



A seven-ton Mack Truck doing the work of eight mule teams in the construction of macadam road.

The City of Rutland, Vermont, owns a seven-ton Mack Dumping Truck, of which Mayor Clement writes as follows:—

"We moved on an average of 114 tons a day with this truck at a daily cost of $5. If this same work were done by teams it would require at least 12 teams costing, in this city, $4 each."

As it cost them only $5 a day to operate the Mack Truck this makes a saving of $43 a day over horses, and yet this is nothing extraordinary.

We have records of hundreds of Mack Trucks earning from $30 to $50 per day. Those who are not getting this result have not adjusted their business conditions to fit the motor truck unit.

An investment in motor trucks can be utilized twenty hours per day if desired, can double up in rush seasons, and does not deteriorate or wear out when idle.

The opportunities for utilizing the motor truck in contracting work are many and varied.

Would you like to know what motor trucks have done for other engineers and contractors? We have the data for you.

The Canadian Fairbanks-Morse Co., Limited

St. John, N.B. Quebec Montreal Ottawa Toronto Winnipeg Saskatoon Calgary Vancouver

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Across Canada with the Imperial Wire & Cable Company, Limited

Toronto Montreal Winnipeg

First of a series of advertisements showing buildings of national importance which have been wired with Imperial Wire & Cable Co.'s, Limited, wires.

This picture shows

The Ritz-Carlton Hotel, Montreal

Architects—Warren & Wetmore—New York.
Engineers—Mailloux & Knox—New York.
Electrical Contractors — J. Livingston & Co. —New York.

This hotel was wired with "Imperial" Higrade Rubber Insulated Wire.

Address enquiries to nearest office, Montreal, Toronto, Winnipeg; Alberta and British Columbia enquiries to Northern Electric & Manufacturing Co., Limited, Calgary and Vancouver.

Everybody Who Builds

Concrete Walls, Concrete Walks or Curbs, Concrete Anything

can have the best Concrete that can be made at the least possible cost

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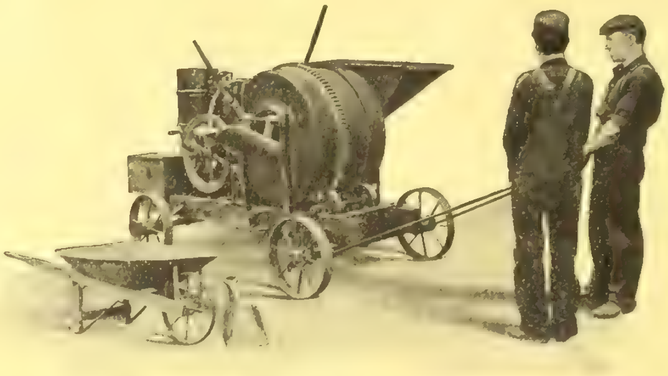
Our No. 4 RANSOME MIXER



No. 4 Ransome Concrete Mixer.

is the equal of our larger machines in efficiency and is sold at a price which makes it an easy and a wise purchase for anybody.

It has a batch capacity of 4 cubic yards per hour, which is ample for any small concrete job. No. 4 Mixers are sold in one way only : i. e.—mounted on Trucks, with gasoline engine, direct drive. This is a powerful engine for its rated H. P. and the best designed—a most perfect operating engine.

The No. 4 Ransome is a great time saver in every respect. As we equip these machines with a special batch charging hopper, which is being filled while the batch in the drum is mixing—no time is lost in charging drum. By the simple lever arrangement, the whole unmixed batch is fed into the drum in an instant and the loading gang keeps right on with their work without any waits whatever. The batch is instantly discharged by merely reversing the discharge chute.

Let Us Send You Particulars

F. H. Hopkins & Co.

MONTREAL

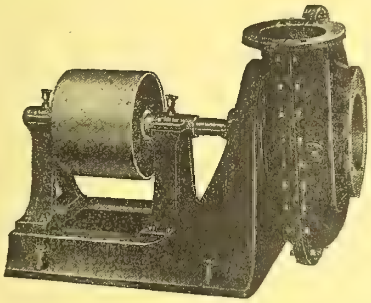
BRANCH OFFICES: **General Supply Company of Canada, Ltd., Winnipeg Agents**
Ritchie Contracting & Supply Company, Ltd., Vancouver Agents

Vol. 27 Toronto, July 9, 1913 No. 28

ESTABLISHED 1886

Contract Record and Engineering Review

Steam and Power Pumps
Condensers, Travelling Cranes



The Smart-Turner Machine Co. LIMITED
HAMILTON, CANADA

"MADE IN CANADA"

Bent Glass

Made in all Kinds of Glass on Short Notice

Large Bent Plate Glass for Shop Fronts a Specialty

The Toronto Plate Glass Importing Company, Limited
(HILL & RUTHERFORD, Managing Directors)
Head Office and Works: 91 to 133 Don Roadway
TORONTO

INGERSOLL-RAND
SHEET PILE DRIVERS
- —Prove the Value of Experience.
- —Utilize all the Energy.
- —Have Standard Mechanism.
- —Are Handled with Facility.

Send For K-139.

Canadian Ingersoll-Rand Co., Limited
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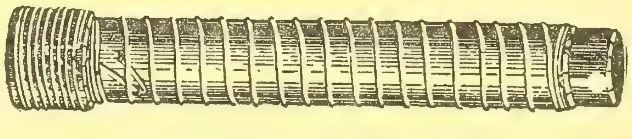
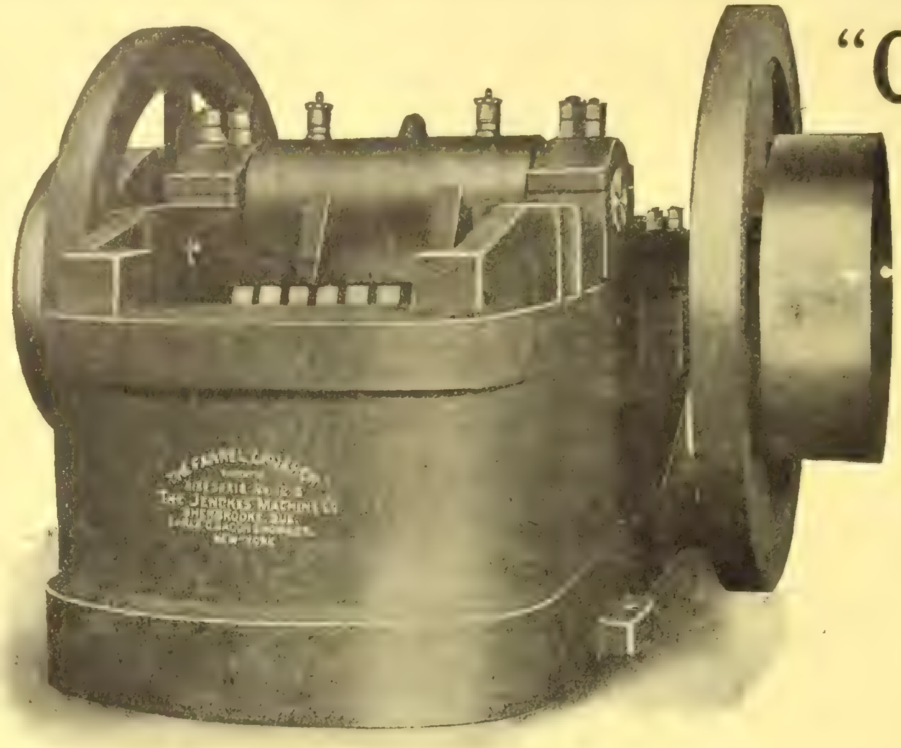


Continuous and Machine Banded Wood Stave
WATER PIPE
RESERVOIR TANKS
for city and town Water Systems, Fire Protection, Power Plants, Hydraulic Mining, Irrigation, etc. One-half the cost of Iron Pipe—and better.

Pacific Coast Pipe Co., Limited
P. O. Box 563 Vancouver, B. C.
Office and Factory, Granville St., near High Bridge
WRITE FOR CATALOGUE
Full Particulars and Estimates Furnished

Alphabetical Index of Advertisers, Page 16 Classified Directory to Advertisements, Page 6



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Complete Crushing Plants

Our Specialty

Many Years Experience and Exceptional Facilities

Ask for Copy of New Catalogue

THE JENCKES MACHINE COMPANY, LIMITED

General Offices: Sherbrooke, Que. **Works: Sherbrooke, Que. - St. Catharines, Ont.**

Sales Offices:—Sherbrooke, Montreal, St. Catharines, Cobalt, So. Porcupine, Vancouver, Nelson

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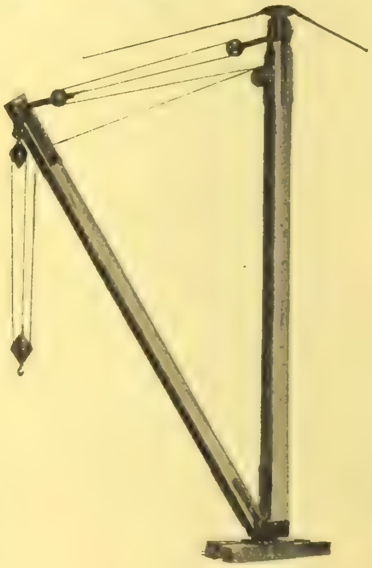
Loaded with DOLLARS is assured to All users of

"American" Derricks

which meet the three principal requirements of modern construction work

Reliability—Rapidity—Economy

There isn't a day that we don't help some contractor to success. May we help you today?

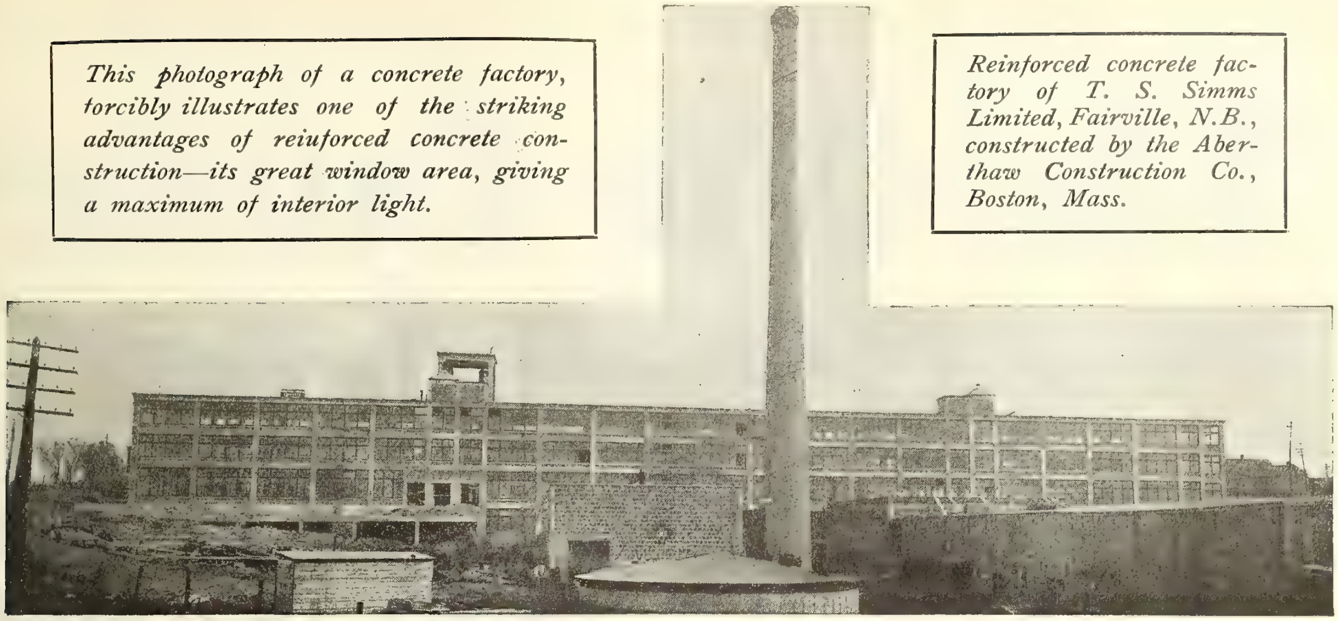


American Hoist & Derrick Company, ST. PAUL, MINN., U. S. A.

Gorman, Clancey & Grindley, Edmonton and Calgary, Alta., and Nelson, B. C.
Vancouver Machinery Depot, Ltd., Vancouver, B. C. Stuart Machinery Co., Winnipeg Can.
General Supply Co. of Canada, Ltd., Montreal, Ottawa, Toronto, Canada.

This photograph of a concrete factory, forcibly illustrates one of the striking advantages of reiuforced concrete construction—its great window area, giving a maximum of interior light.

Reinforced concrete factory of T. S. Simms Limited, Fairville, N.B., constructed by the Aberthaw Construction Co., Boston, Mass.



Concrete Factories are Most Efficient

The efficiency of a machine is the ratio of the amount of work a machine does to the amount of work required to operate it. The output is equal to the input minus the work lost or wasted. The less wasted the greater the efficiency.

In the same way the efficiency of a factory may be defined as the ratio of output to input. Output financially, is increased by reducing unnecessary expenses.

Concrete Stops Wastes

Concrete buildings are proof against fire, water and vermin. They give the maximum light and are sanitary. They resist vibration, and are permanent and durable.

Fire-proofness reduces insurance rates. Water or liquids used in certain processes will not leak through floors to destroy valuable goods below. Rats and other vermin find no place to live in a concrete building, thus eliminating losses from this cause. Maximum light and sanitary conditions increase efficiency of employees. Lack of vibration reduces wear and tear on machines. Permanency and durability reduce depreciation.

The way in which concrete stops these leaks is fully described in our handsomely illustrated 224 page book, "Factories and Warehouses of Concrete." It contains photographs and data of factories and warehouses for all classes of industries.

You can have a copy free if you will mention this advertisement.

Canada Cement Company
Limited
Montreal

The Disc Crusher Principle

Do you know about the latest and best crushing principle yet introduced?

Send for Catalogue on the

SYMONS DISC CRUSHER

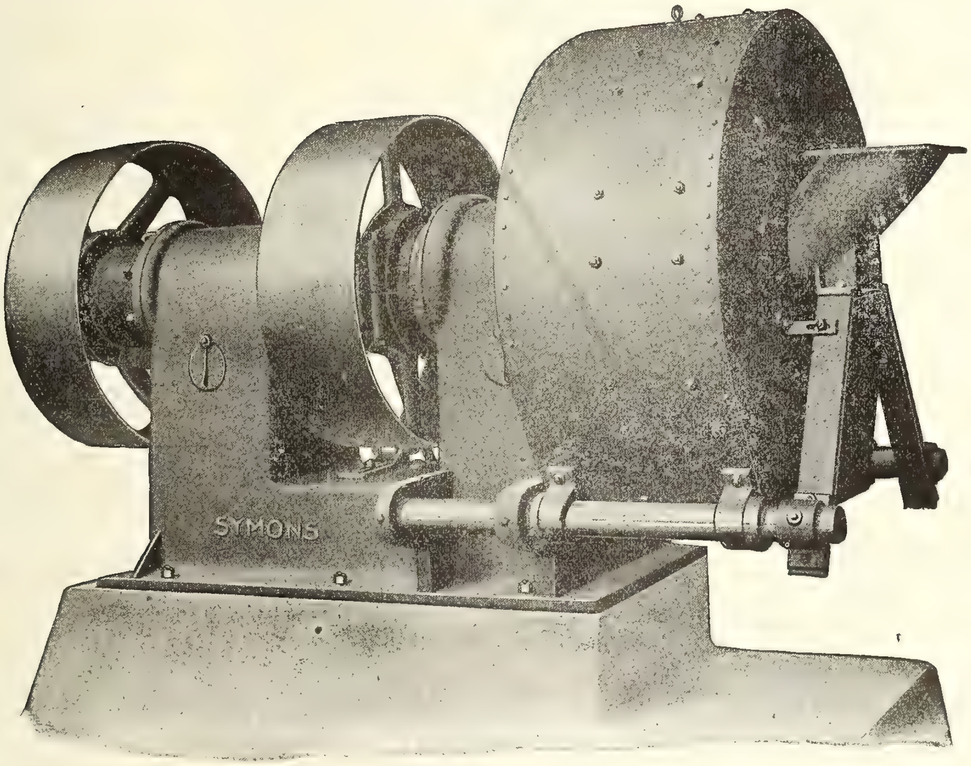
which tells all about the machine that will crush 40 tons of quarter inch or 1000 tons of two and a half inch per ten hour day.

Montreal, 318 St. James St.
Toronto, 155 West Richmond St.
Cobalt, opp. Right of Way Mine.
Winnipeg, 259-261 Stanley St.

MUSSENS

The Crusher That Has Proven Itself on the Job

SYMONS DISC CRUSHER



The Greatest Recrusher on the Market

LIMITED

Calgary, 10th Ave. & 3rd St. E.
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Quebec, 71 Maple Ave.
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Halifax, 78 Granville St.

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quarter page, four headings; half page, eight headings; full page, sixteen headings.

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(Continued on page 12)

Canadian Bank of Commerce, College and Dovercourt, Toronto.

Don Valley Uniformity

THE uniformity of size and shade and the unvarying good quality of Don Valley Clay Products has made them the popular material for every class of building.

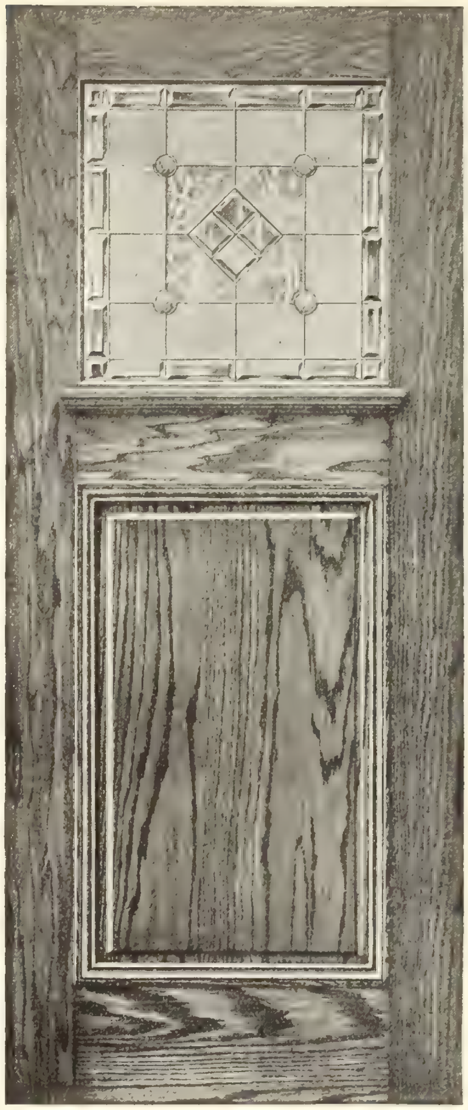
For bank buildings the architectural possibilities of Don Valley Bricks are almost without number. Some pleasing and permanent effects may be obtained by arranging the bricks in patterns or panels.

Don Valley Clay Products are specified for Canada's finest buildings.

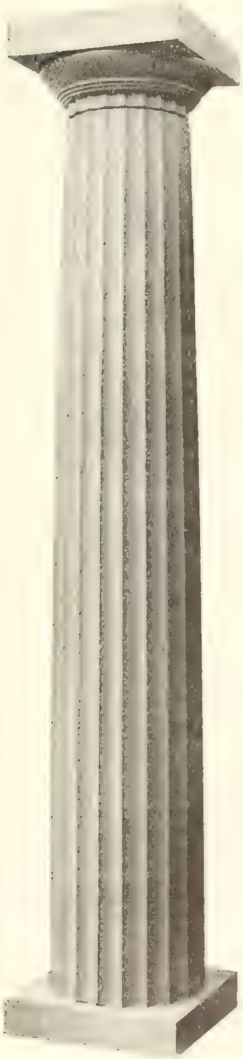
Use the Best Don Valley

Don Valley Brick Works
Toronto
Ontario

Doors
Base
Balusters
Columns



Sash
Trim
Turnings
Newels



IF you want high-class doors of good appearance and made of selected woods, we suggest Batts Limited as the place to get them. The workmanship in our doors is thorough and all woods are properly seasoned giving the doors long life.

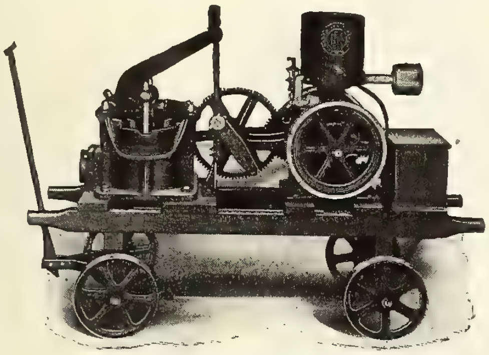
In our columns the special "V" lock joint makes it impossible for them to crack or open.

Specify "Batts" doors, columns and trim.

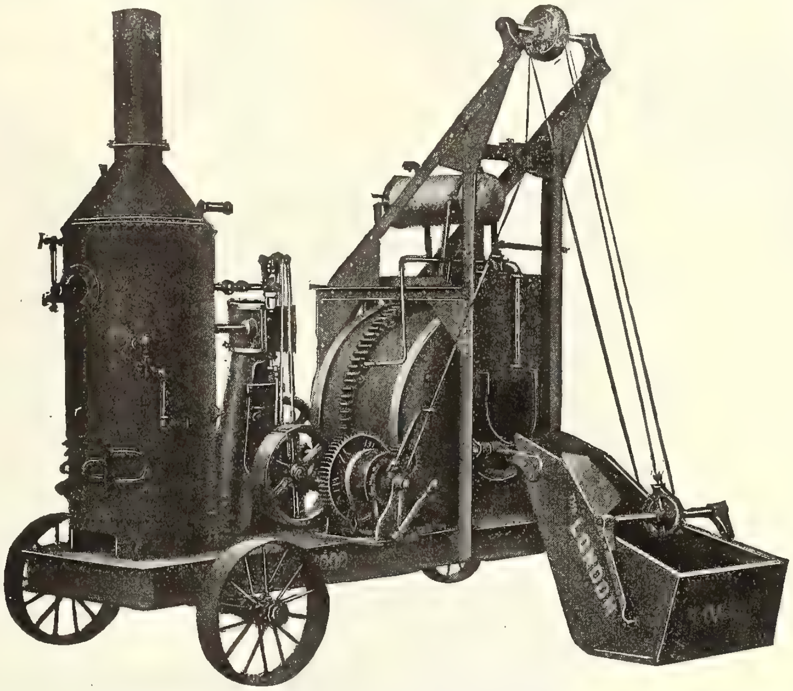
Batts
Limited
Pacific Ave., Toronto

Before You Buy Concrete Machinery

or Equipment of any kind, write us for our 180 page catalogue.

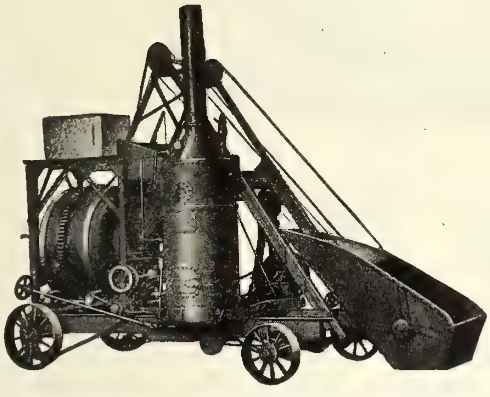


Power Diaphram Pump



London Standard Drum Batch Mixer
This machine is built in five sizes, fitted with any kind of power ; also with traction drive if required.

We are the largest manufacturers of Concrete Machinery in Canada.



Rear Discharge Traction Mixer. This machine is also equipped with Boom.

We do not build machinery down to a price but up to a standard.

London Sill Step and Window Cap Mould

A few lines we manufacture—

Concrete Mixers, Mortar Mixers, Tile Moulds, Drain Tile Machines, Side Walk Tile Machines Cement Block Machines, Cement Brick Machines, Sill Step and Window Cap Moulds Gasoline Engines, Screens and Elevators Fence Post Moulds, Hoisting Engines, Material Elevators, Concrete Carts, Wheelbarrows, Scrapers, Sidewalk Forms, Pumping Outfits

A complete line of Contractors' Tools.

London Concrete Machinery Co., Limited

Head Office and Factory: Cabell St. and Kitchener Ave., London, Ont.

BRANCHES:

WINNIPEG (445 Main St.) W. H. Rosevear, Mgr.
TORONTO (60 Richmond St. W.) F. D. Emsley, Mgr.
CALGARY (622 9th Ave. W.) P. D. McLaren, Mgr.

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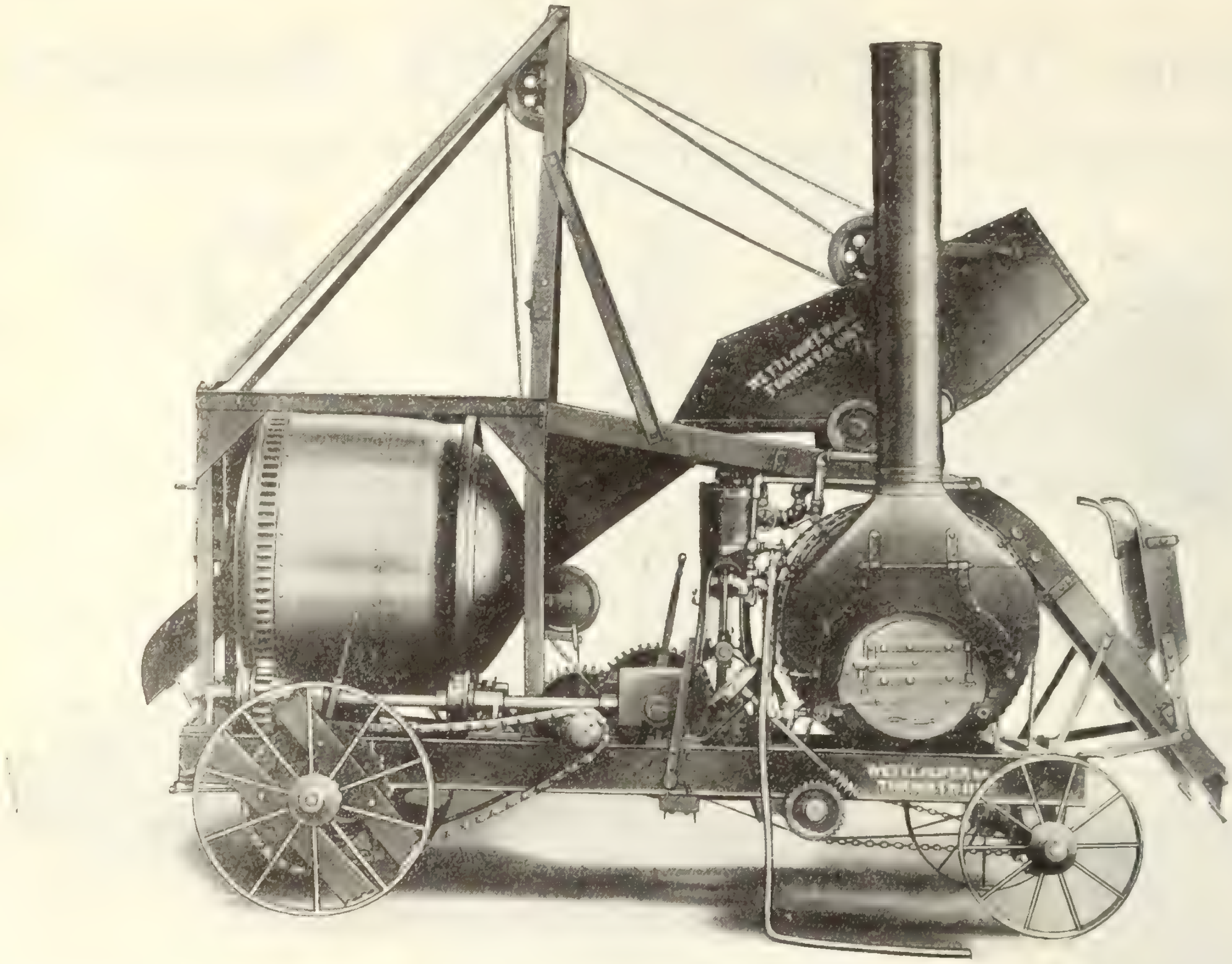
FORT WILLIAM, Northern Eng. & Supply Co. MONTREAL, Foss & Hill Mach. Co.

The Largest Manufacturers of Concrete Machinery in Canada



The Leader of Mixers

IN every line there is a leader and when it comes to concrete mixers the Wettlaufer is supreme. It is efficient in design, perfect in workmanship and constructed of the best materials that money can buy.

The machine illustrated is the Wettlaufer Improved Stationary Heart Shape Drum Traction Mixer. Some of its notable features are:

When mixing the material is being turned in every possible way. In discharge the drum empties clean. The horizontal boiler effects a great saving in fuel. The furnace is the full length of the boiler and has a large combustion chamber.

The load is carried low and evenly distributed making it impossible to upset this machine.

Daily demonstrations at all our branches.

We welcome all who are interested.

Wettlaufer Bros.

178 Spadina Ave., Toronto, Ont.

Factories: Mitchell, Ont., Buffalo, N. Y., Detroit, Mich.

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Crushed Stone

If you want crushed stone in a big hurry come to us and you will get it.

Our bins are always loaded to the top with stone of all grades and shipments can be made the day your order is received.

Quarries located at Dundas and Vinemount.

Portland Cement

Our several cement mills are located at various points that enable us to make prompt shipments with short hauls.

Send us your next order.

Alfred Rogers

Limited

28 King St. West, Toronto

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Pedlar People.
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McDougall Caledonian Iron Wks.
Smart-Turner Machine Co.
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Lecky & Collis.
Mussens Limited.

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Linde British Refrigeration Co.

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Bird & Son, F. W.
Can. Supply & Contracting Co.
Can. H. W. Johns-Manville Co.
Canadian Mineral Rubber Co.
Metallic Roofing Company.
Noble, Clarence W.
Paterson Mfg. Co.

(Continued on page 14)

Ferranti Meters

Glass Case—Top Connections

Simplicity of construction.
Perfect accuracy.
Cyclometer or clock dials.
Top or bottom connections.
Prompt deliveries.
Every meter carefully inspected before shipment.
Absolutely guaranteed.

Send us your probable meter requirements and let us make you a proposition.

Large stock and fully equipped repair and erection Shops at Toronto and Winnipeg.

Steel Case—Top or Bottom Connections

The Ferranti Electrical Co., of Canada, Limited

TORONTO
90 Sherbourne St.

WINNIPEG
56 Albert St.

County Academy, Sydney, N. S. Built of Sydney Pressed Brick

Our plant is the only one of its kind in Canada making pressed brick from blast furnace slag. Brick made from this material is hard as flint—hardens with age and adheres with great strength to mortar.

Prices and Particulars on Request

Sydney Pressed Brick Co.
Limited
Sydney, Nova Scotia

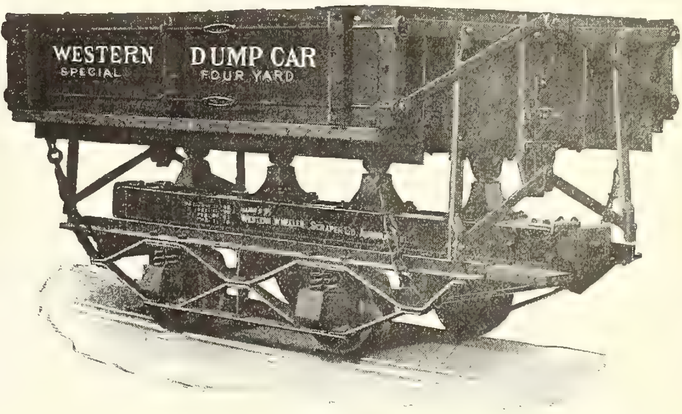
WESTERN DUMP CARS

can be dumped and righted by fewer men and in less time than required for the same operation on many other cars

Prominent Contractors have made the above statement time and time again, and its a proven fact. Just think of the saving.
Western Air Dump Cars are used by many of the largest Railroads and at the Panama Canal. There must be many reasons.

Let us tell you them.

WESTERN WHEELED SCRAPER CO.
AURORA, ILLINOIS
Earth and Stone Handling Machinery
Dominion Supply & Equipment Co., Winnipeg-Calgary-Edmonton—Agents for Manitoba, Saskatchewan & Alberta
E. P. Jamison & Company, Ltd., Vancouver
Agents for British Columbia



Hagersville Crushed Stone

The Toughest Stone for Macadam in Ontario

Record of Logan Avenue, Toronto, Macadamized from Queen St. to Gerrard St., in 1902
Length 2,454 Lin. Ft. Width 24 Lin. Ft. 6,550 Sq. Yds.

COST FOR REPAIRS

1903	$ 0.00	1908	$ 93.26
1904	3.30	1909	200.46
1905	9.35	1910	14.07
1906	37.33	1911	2.29
1907	16.11		

Total $376.17 or 5⅔c. per sq. yd. for repairs for nine years, a little over 6-10 of 1c. per sq. yd. per year.

Why Not Use Hagersville Stone and Get These Results?

Hagersville Contracting Co.
Hagersville, Ont. **Limited**

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Shunk Plow Company.

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Dominion Sewer Pipe Co.
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National Iron Works.
Ontario Lime Co., Ltd.
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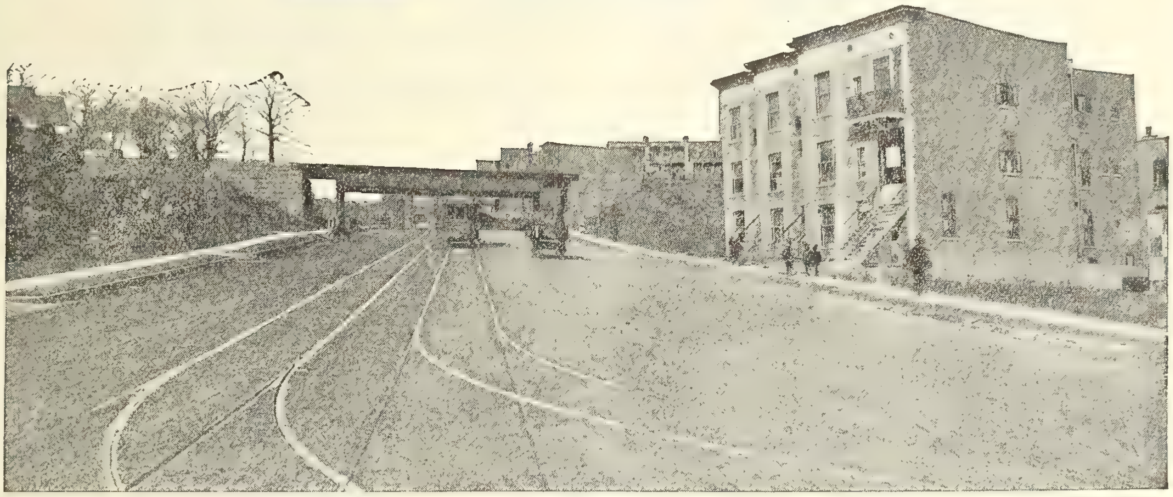

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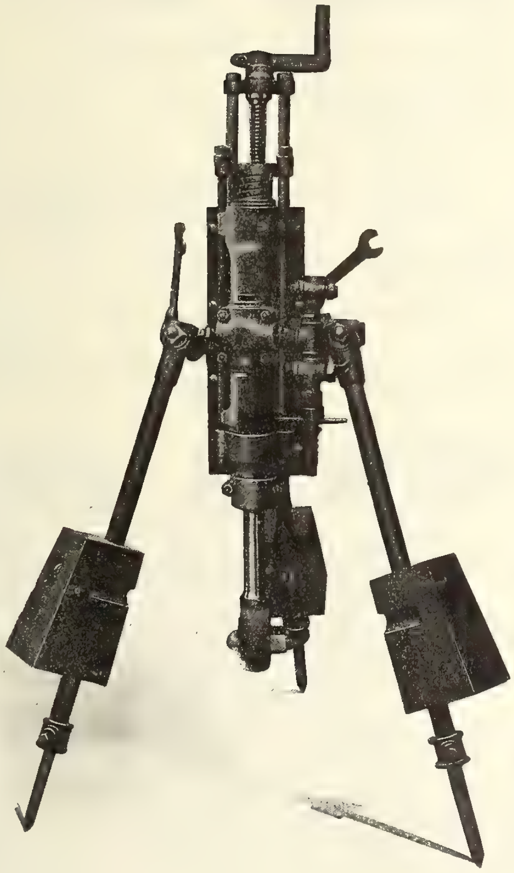

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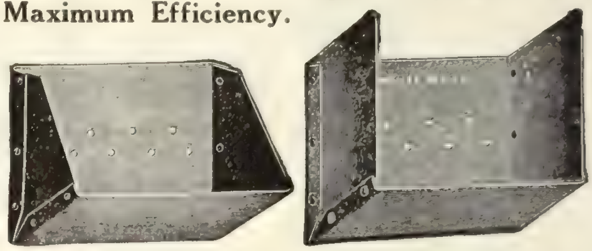

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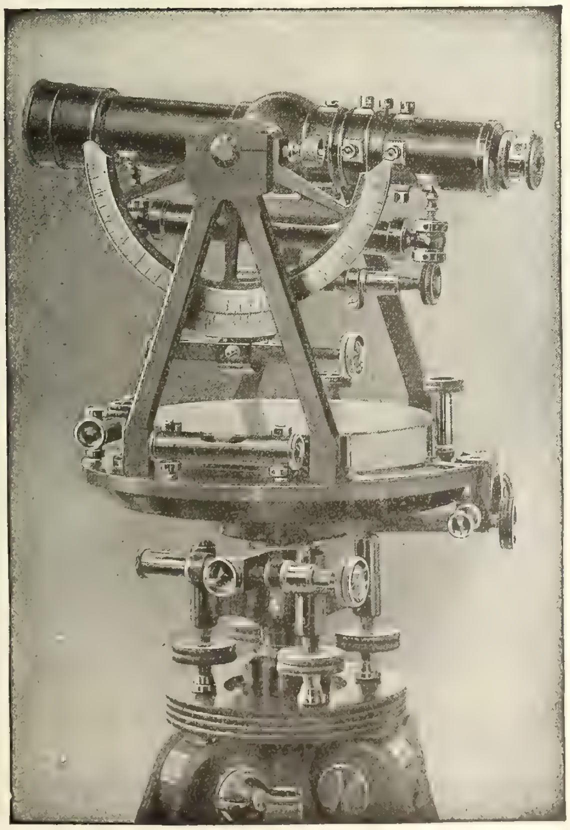

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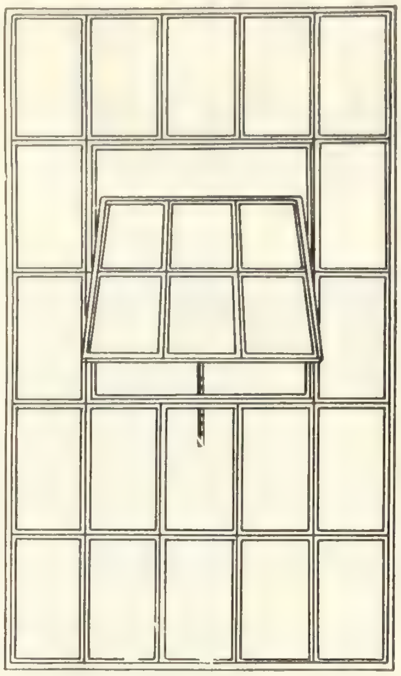

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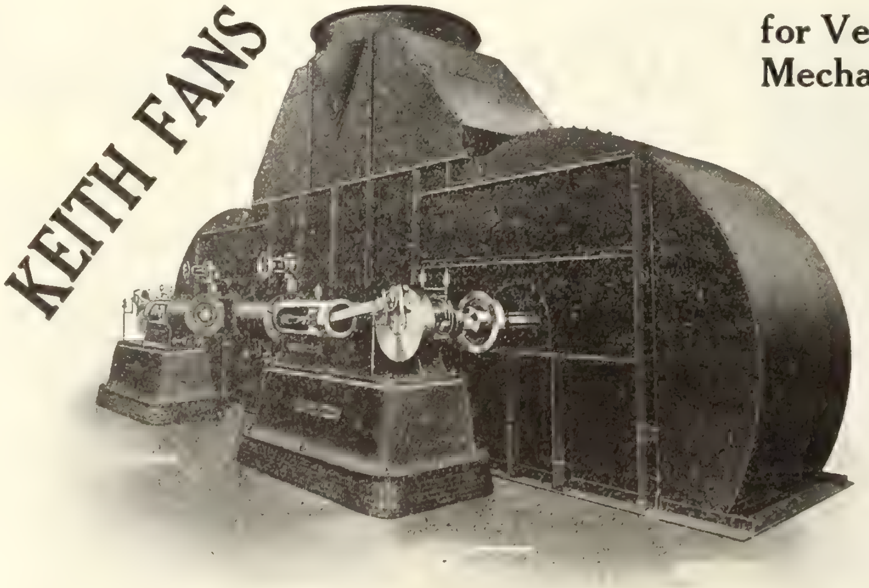

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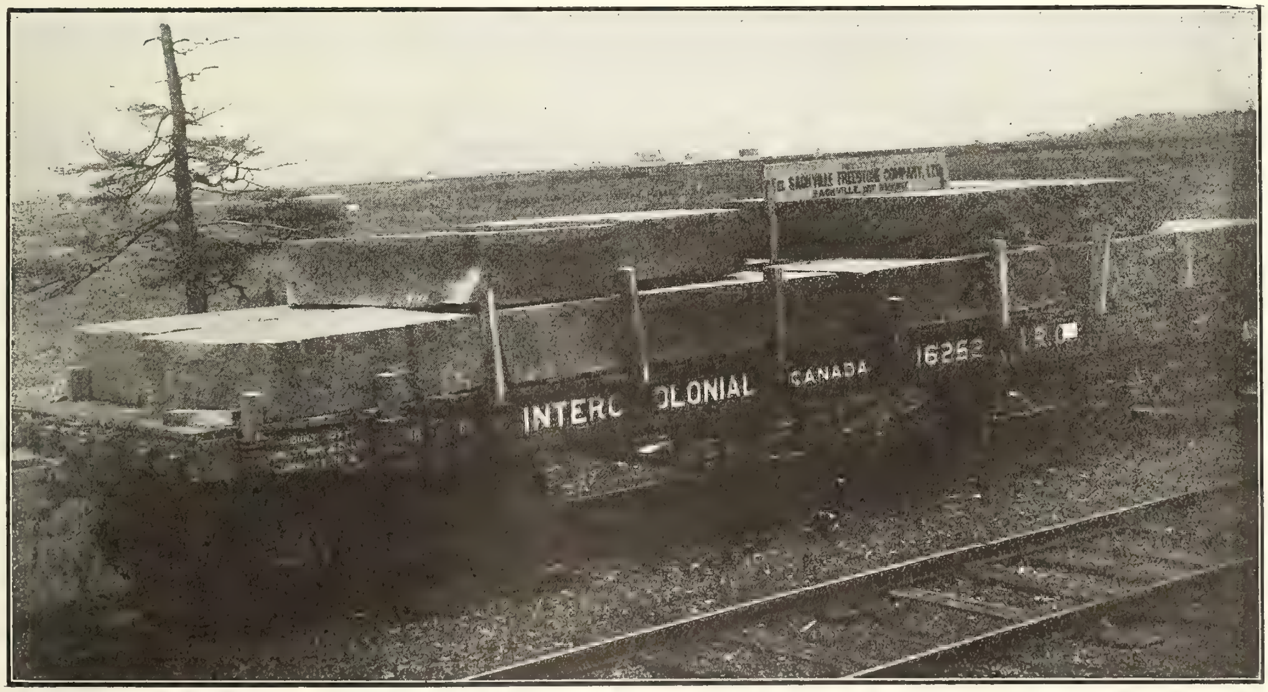

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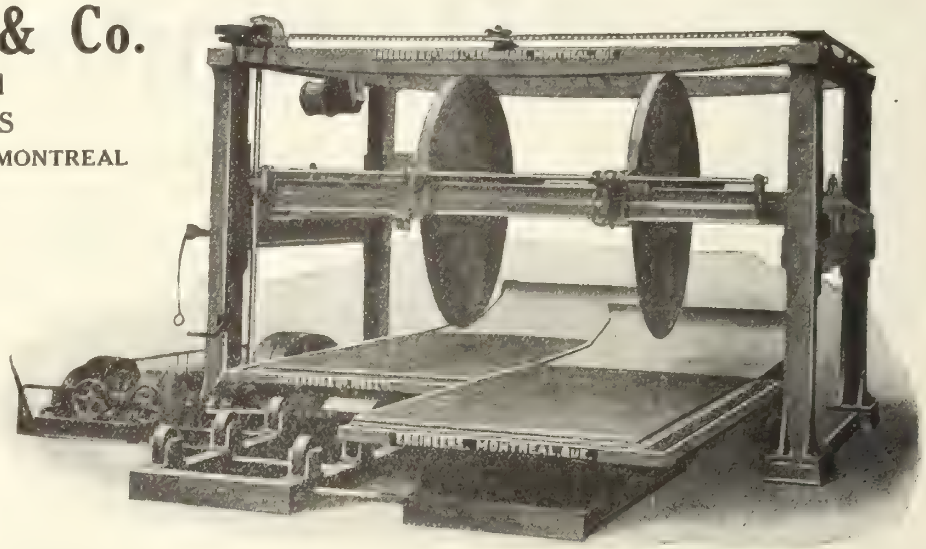

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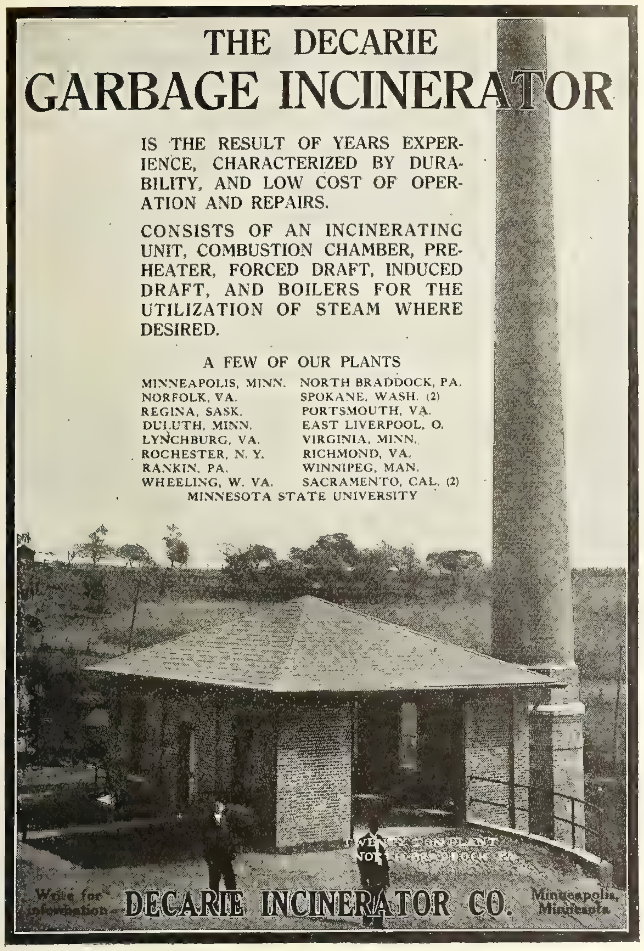

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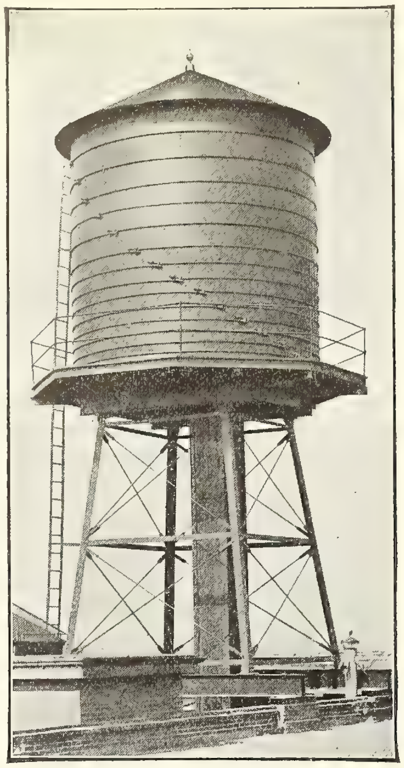

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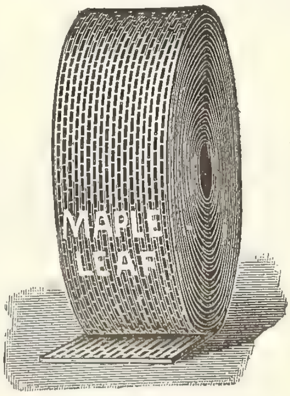

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It runs absolutely true on the Pulleys.

It is built of plies of selected duck.

Write for Information and Prices.

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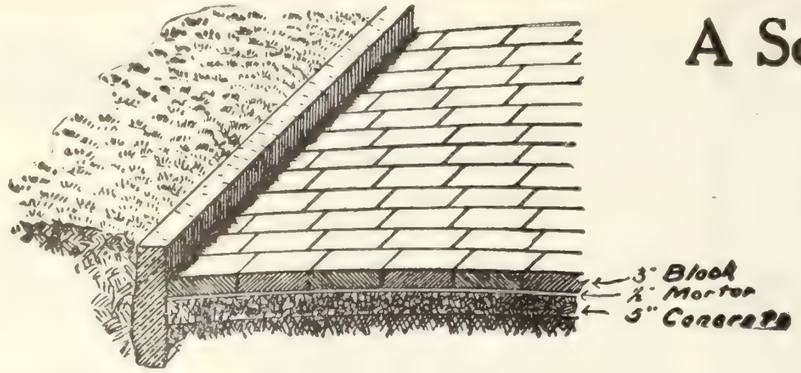
Hamilton, Canada



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must be

Durable and Non-Abrasive.
Non-Absorbent and nearly Noiseless.
Unaffected by extremes of Temperature.
Sightly and Sanitary.
Easily Repaired and easily Cleaned.

These requirements are met by

Asphalt Block Pavements

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The Ontario Asphalt Block Company, Limited - Windsor, Ont.

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Twisted Steel Bars
FOR REINFORCING CONCRETE

Bands and Flats all Sizes

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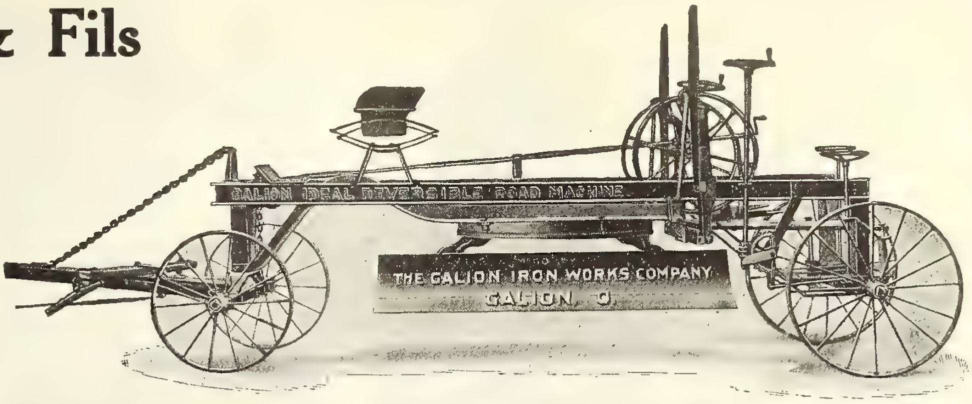
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**CANADA STEEL Co
LIMITED
HAMILTON CANADA**

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For Reinforcing Concrete
Plain Rounds Squares
Twisted Squares
Cross Arm Braces, Plain and Galvanized.

We can ship from stock

Ask for prices—they will interest you.

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Angles from ¾ x ¾ in. up to 2 x 2 ins.
Round and square from ⅜ in. up to 1¼ ins.
Flats from 3/4 in. up to 4 ins. in width, and other special sections.

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Also Extensively for Dredging, Exhaust Steam, Compressed Air, etc.**

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Easily installed and securely connected with our Forged Steel Flanges or All Steel Bolted Joints.

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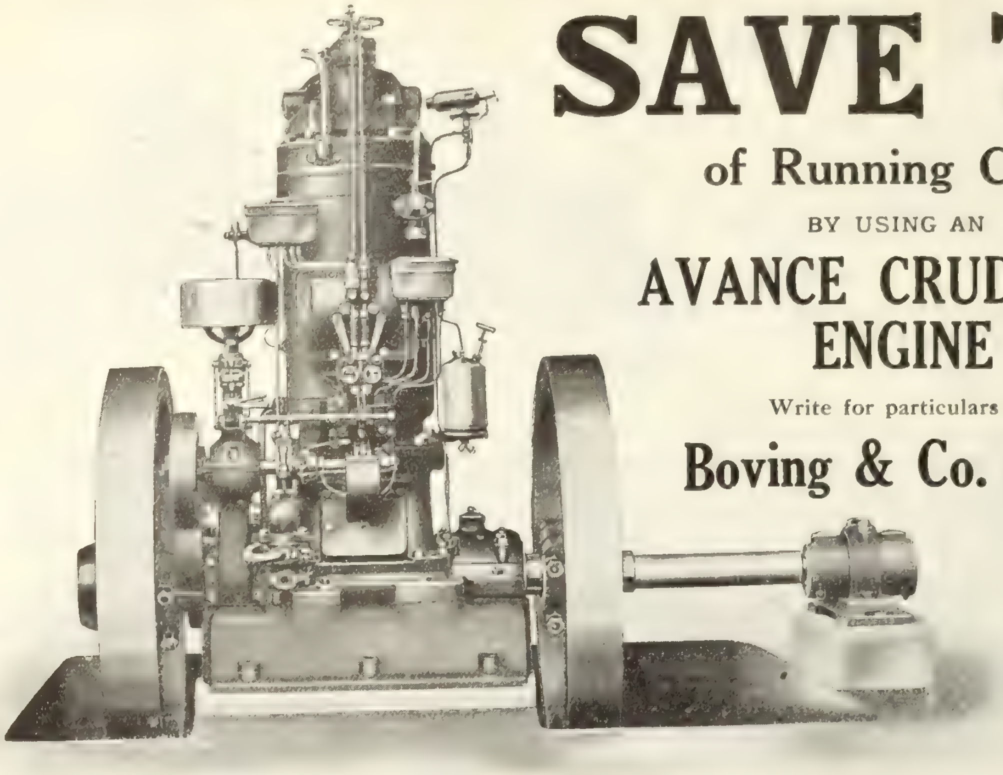

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Three Sizes, 16, 25, 35 in. Ovens

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We are headquarters for Ranges and Heaters Built Especially for Contractors and Camp Use.

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For Coal or Wood. With or without copper tank.

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This is a good example of Meadows' stair work. Our plant is complete for the successful manufacture of this particular class of work. Specifications can be followed or we will submit designs.

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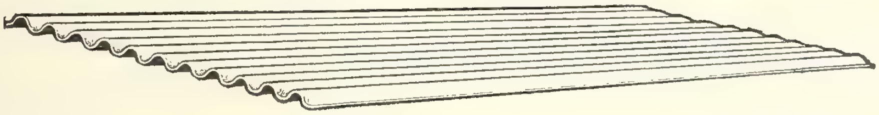

Lessens Depreciation

The sum which must annually be spent on upkeep and written off for depreciation of buildings can be greatly reduced by the use of Asbestos Corrugated Sheathing.

A mill, elevator, freight shed, factory or warehouse roofed and sheathed with this material presents a practically everlasting exterior, proof against fire and the elements.

Made of two indestructible materials, Portland Cement and Asbestos, this sheathing is not subject to rust or decay, and never requires painting or waterproofing. In fact it grows harder and tougher with age and exposure.

Asbestos Corrugated Sheathing is made in standard lengths of 4, 5, 6, 7, 8, 9, and 10 feet by 27½ inches wide with corrugations of 2½ inch pitch.

Write for our Booklet 9, which shows in detail the methods we have perfected of attaching sheets to wood and steel framing, and of covering ridges and corners.

Asbestos Manufacturing Co., Limited

Address E. T. Bank Bldg., Montreal. **Factory at Lachine, P.Q. (near Montreal)**

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TRADERS BANK BUILDING
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August 16th. 1912.

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In issuing your final certificate for the stone work of the Graphic Arts Building, permit me to say that I have been very much pleased with the manner in which you handled this important contract. The material is of an excellent quality, and deliveries were up to promises. The careful attention and courtesy of the officials of your Company has done much to facilitate the rapid completion of the building.

Yours truly,

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Architect.

The Roman Stone Co.Ltd.,
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Beath Scotch Derricks

Hand or Power

THE construction of Beath Scotch Derricks embodies several points of merit not found in other makes.

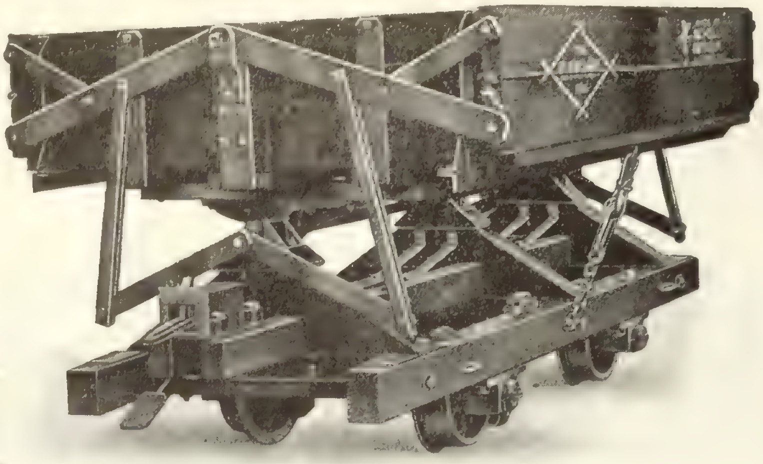
All stress parts are **steel** not cast iron. Bottom Pintle Bearing is of ball and socket type and works in a bath of oil, thus ensuring an easy movement at this joint.

Beath Derricks are provided with self-oiling bearings, ensuring easy operation and reducing wear to a minimum.

We also make Jinniwink Derricks, Stiff Leg Derricks, Guy Derricks, and Steel Derricks for heavy service. Hand or Power operated.

Send us your enquiries for Derricks

W. D. Beath & Son, Limited
ENGINEERS AND MANUFACTURERS
20-30 Cooper Ave., Toronto



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GLENGARRY

Equipment is Used on all the Largest Contracts

Small Size Dump Cars

For contractors on small jobs, or for jobs where larger capacity cars are not required.

"GLENGARRY" 1¼ AND 1½ YD. TWO-WAY SIDE DUMP CARS

A great many contractors have found the above sizes very handy for certain jobs. These cars are strong enough for steam shovel use, but we recommend them for hand shovelling and horse draw. They have all the good features of this famous line of cars and differ only in size. Each door can be thrown up, or both doors together so that shovelling can be done from both sides at once. Being shipped in the knock down in carloads they load many more than other makes.

Manufactured Exclusively by

The Schell Foundry & Machine Company, Limited

Write for prices. Alexandria - - Ontario ***Send for photographs.***

Save Time, Trouble and Money

By Using a

THEW SHOVEL

for that EXCAVATING CONTRACT

The contractor with men and teams cannot compete successfully with the man who owns a THEW SHOVEL.

THE REASON WHY

The smallest Thew does the work of from twenty to forty men at one-third of the cost. The Thew, being able to load a wagon a minute, will often save enough in team time to pay its entire operating cost, which means that you are loading dirt for practically nothing. Hand labor is difficult to secure, hard to hold and inefficient in practice, while the Thew is always on the job.

It will pay you to investigate this shovel. Write for our catalog, C. R. It will explain the numerous features which make the Thew the most practical and economical machine of its kind on the market and will give you valuable information regarding cost of excavating.

The Thew Automatic Shovel Company, Lorain, Ohio

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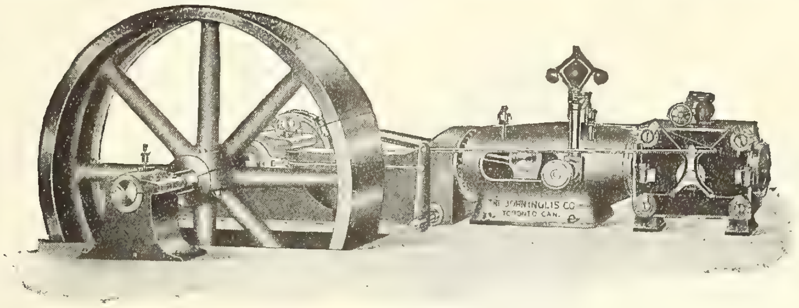
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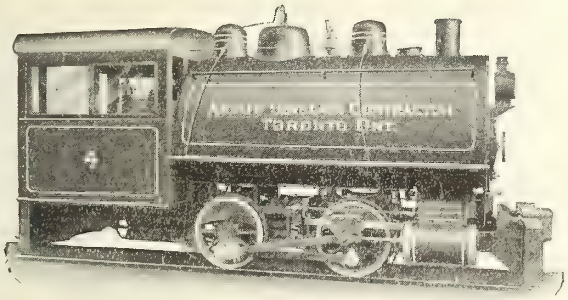
THE value of Experience in the manufacture of "Inglis" Engines is emphasized by the ever increasing demand for our product.

Write us for particulars

The John Inglis Company, Ltd., 14 Strachan Avenue, Toronto, Canada
ENGINEERS AND BOILER MAKERS

KEEP YOUR EQUIPMENT GOING



You make money when you keep your equipment going. You'll earn most with equipment that will wear a long while and is easily and quickly repaired. This applies particularly to locomotives.

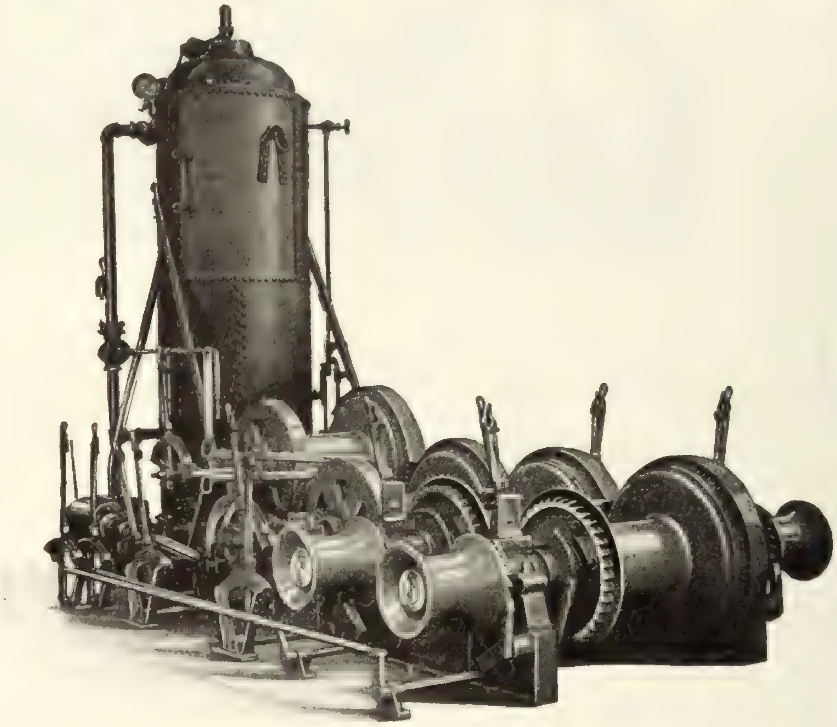
Our locomotives are designed and built for long life, hard work and quick repairs.

Extra parts are kept in stock for immediate shipment. These are made in jigs and to gauges carefully checked. Rigid adherence to standards of material are supplemented by strict inspection and tests. Each repair part must therefore go into place with the same degree of perfection as the original part. No machine shop is necessary. This is important when the locomotive operates at a distance from a repair shop.

Consider this when you purchase a locomotive

MONTREAL LOCOMOTIVE WORKS, LTD.
DOMINION EXPRESS BUILDING, MONTREAL, CANADA

"BEATTY" HOISTS



Special Bridge Erection Engine furnished the Canadian Bridge Company, the Hamilton Bridge Works Company and the Dominion Bridge Company.

The two rear drums have internal ratchets and pawls automatically holding the load in any position. The two front drums have standard ratchets and pawls, also four independent winch heads. Boiler is of extra height to propel car and furnish steam for air compressor.

Standard Sizes of Hoisting Engines shipped from stock.

Six sizes of Clamshells on hand.

Quick shipment of any type of Excavating or Material Handling equipment for use on land or water.

"Beatty Plant" on your work means continuous service and complete satisfaction.

Let us give you the benefit of our Fifty Years of Experience in Building Contractors Machinery.

Full information gladly sent you. Write now.

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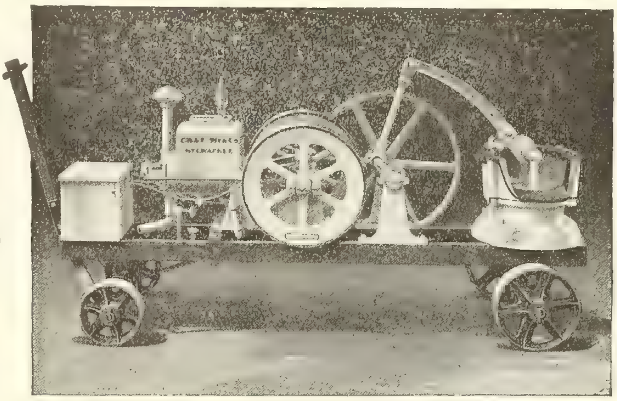
Power Driven Bilge Pump

This Portable Power Driven Diaphragm Bilge Trench Pump mounted on channel iron truck or wood skid is a complete Power Driven outfit for use of builders in pumping water from footings, trenches, cellars, coffer-dams, or on public works, where it is necessary to raise large quantities of water. The engine is a strong 3 H.P. water hopper cooled and the entire equipment is of up-to-date design, strong and simple in construction.

This Pump is made in two sizes, No. 3 Pump with 3″ side suction, pump capacity 3,000 gallons per hour and No. 4 Pump with 4″ side suction, pump capacity 6,000 gallons per hour.

Never sleeps and always on the job.



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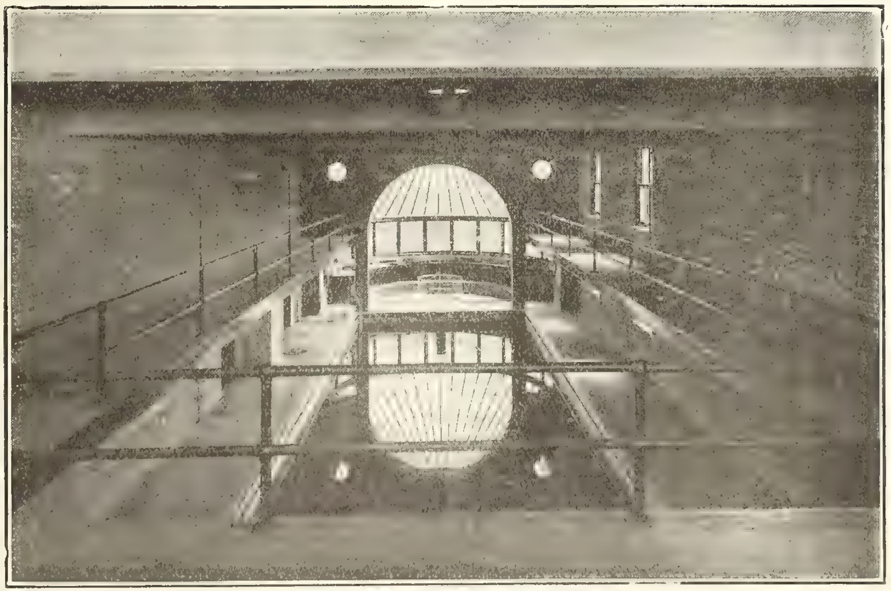
Water-proofs Concrete



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Broadview Y.M.C.A. Swimming Pool.

Swimming pools of Broadview, Central West End Y.M.C.A. buildings, successfully waterproofed with Toxement.

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Adjustable Safety Suspended Platforms for use on steel and concrete frame buildings.

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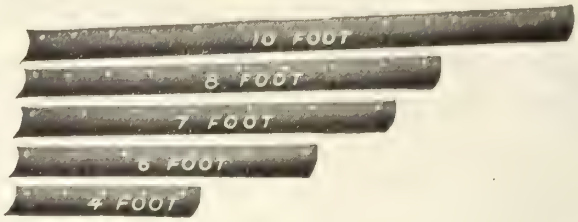

We manufacture and carry in stock road plows, scraper blades and moldboards ½ inch thick and lighter, of the very highest quality of steel and workmanship, for all makes of road scrapers. Blades guaranteed to be of the very best quality. Write for prices, discounts and list No. 20.

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"Hammer Brand"
Hard Wall Plaster

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It neither loosens nor falls off, it allows carpenters to follow plasterers without loss of time and lasts as long as the building.

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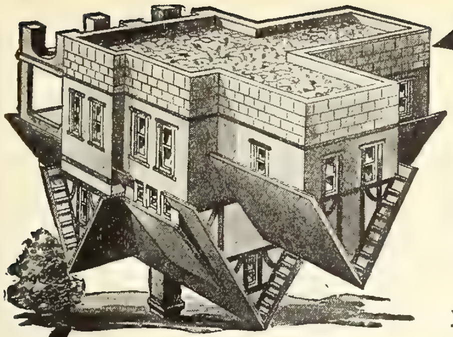

Make the Roof as Everlasting as the Foundation!

You construct the foundation of buildings of stone because you know that nothing can affect stone—know that it will *last forever.*

Now suppose you specified roofs of the same everlasting stone as foundations. What an everlasting fireproof roofing you'd have!

Then why not put on a stone roofing? J-M Asbestos Roofing is a light-weight, flexible roofing that is **solid stone** to all intents and purposes.

J-M ASBESTOS ROOFING

is made of several sheets of Asbestos—**stone**—securely cemented together with Trinidad Lake Asphalt—a **mineral.** It is **all** mineral **all the way through.**

Think what it would mean to your clients if their buildings were covered with J-M Asbestos Roofing. It would mean not only permanence and absolute security from leaks, no matter what the climate or weather; but freedom from the cost and trouble of coating or re-graveling, and positive protection from sparks and burning embers. It would mean that their roofing would **cost less per year of use** than any other roofing on the market.

Dealers sell this roofing, or we sell it direct from our nearest branch.

Asbestos is a peculiar substance, and very interesting. Perhaps you'd like a sample so you can see what it's like, also our illustrated catalog No. 303.

Mail your request **today** to our nearest branch.

THE CANADIAN H. W. JOHNS-MANVILLE CO., LIMITED

Manufacturers of Asbestos and Magnesia Products

ASBESTOS

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1595

WHAT MIXER WOULD YOU CHOOSE
If You Had a Contract to Mix

5,000,000, cu. yds. of Concrete?
The engineers of the Panama Canal had this amount of concrete to mix and after comparative tests they chose **Austin Improved Cube Mixers.**

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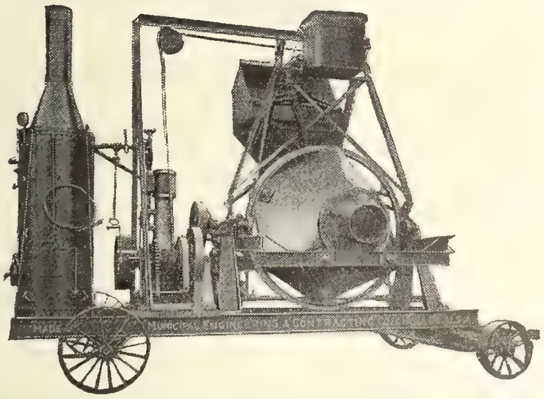
The builders of the Los Angeles Aqueduct had this amount of concrete to mix and they chose **Austin Improved Cube Mixers.**



100,000 cu. yds of Concrete?
The contractors for the Detroit River Tunnels had this amount of subaqueous concrete to place and they chose **Austin Improved Cube Mixers.**

Austin Cube Mixers Mix by Kneading

The batch is folded and refolded and squeezed into alternate pyramids and wedges many times each revolution of the cube and every mixing motion is a full batch motion—these are the the secrets of rapid mixing and perfect mixing.

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AGENTS WANTED IN OPEN TERRITORY

If you write

"Interlock Welded Necks and Atwood Line Welds"

into your piping specifications, you avoid three-fourths of your joint troubles. The **Interlock Welded Neck** eliminates the use of cast fittings for branch lines. The **Atwood Line Weld** permits the fabrication of pipe into maximum shipping lengths with a consequent reduction of line joints. Both are our patents. Each is as strong as the pipe itself.

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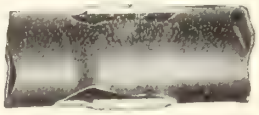

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should be advertised for in the "Tenders and For Sale Department" of the CONTRACT RECORD AND ENGINEERING REVIEW. This paper is the "Tender Ad." medium of Canada and always brings bids from the reliable contractors and supply houses.

File your plans for any work on which you are inviting bids, in our offices at Toronto, Montreal, Winnipeg or Vancouver.

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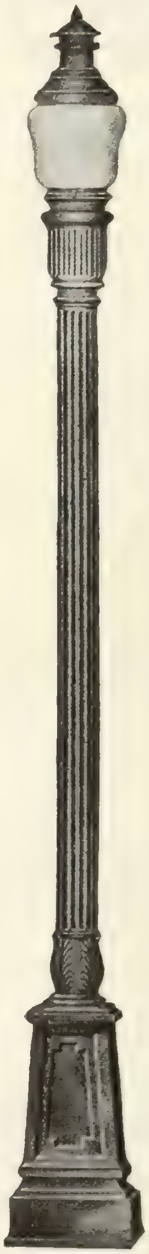
MORRIS
Street Lighting Poles



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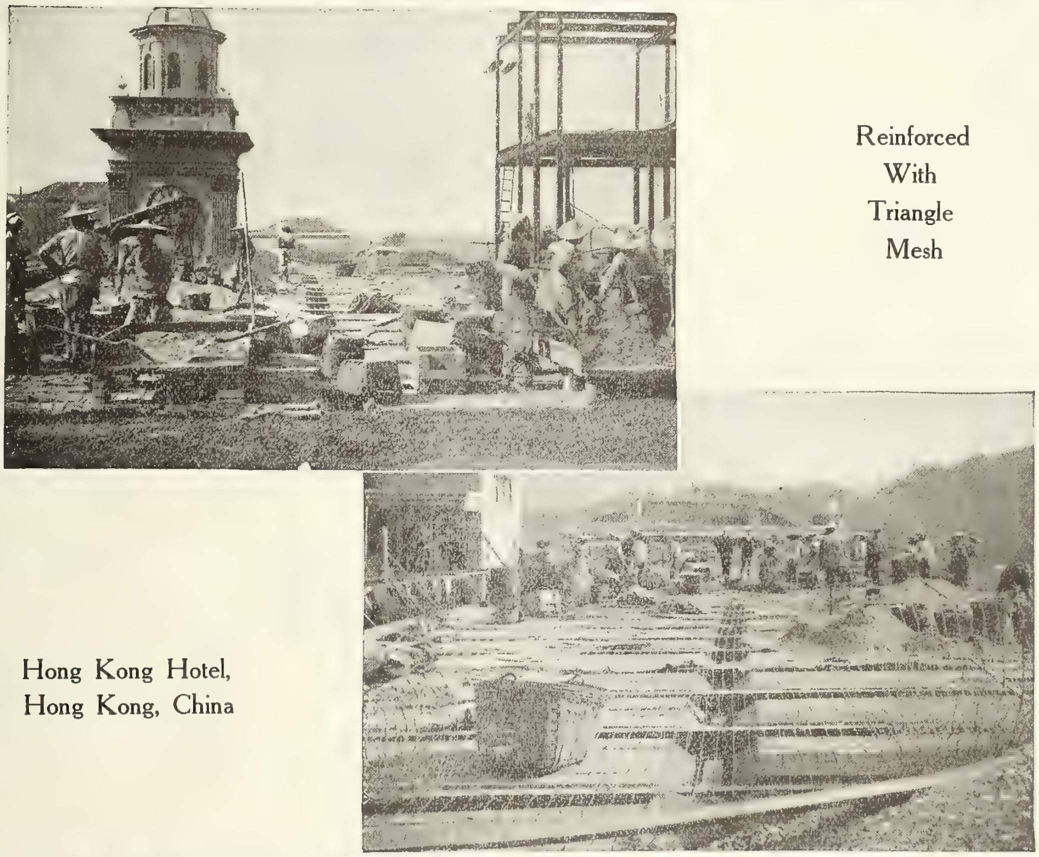
Due to our increased capacity we can ship carload quantities in about two weeks from receipt order and full details at mill.



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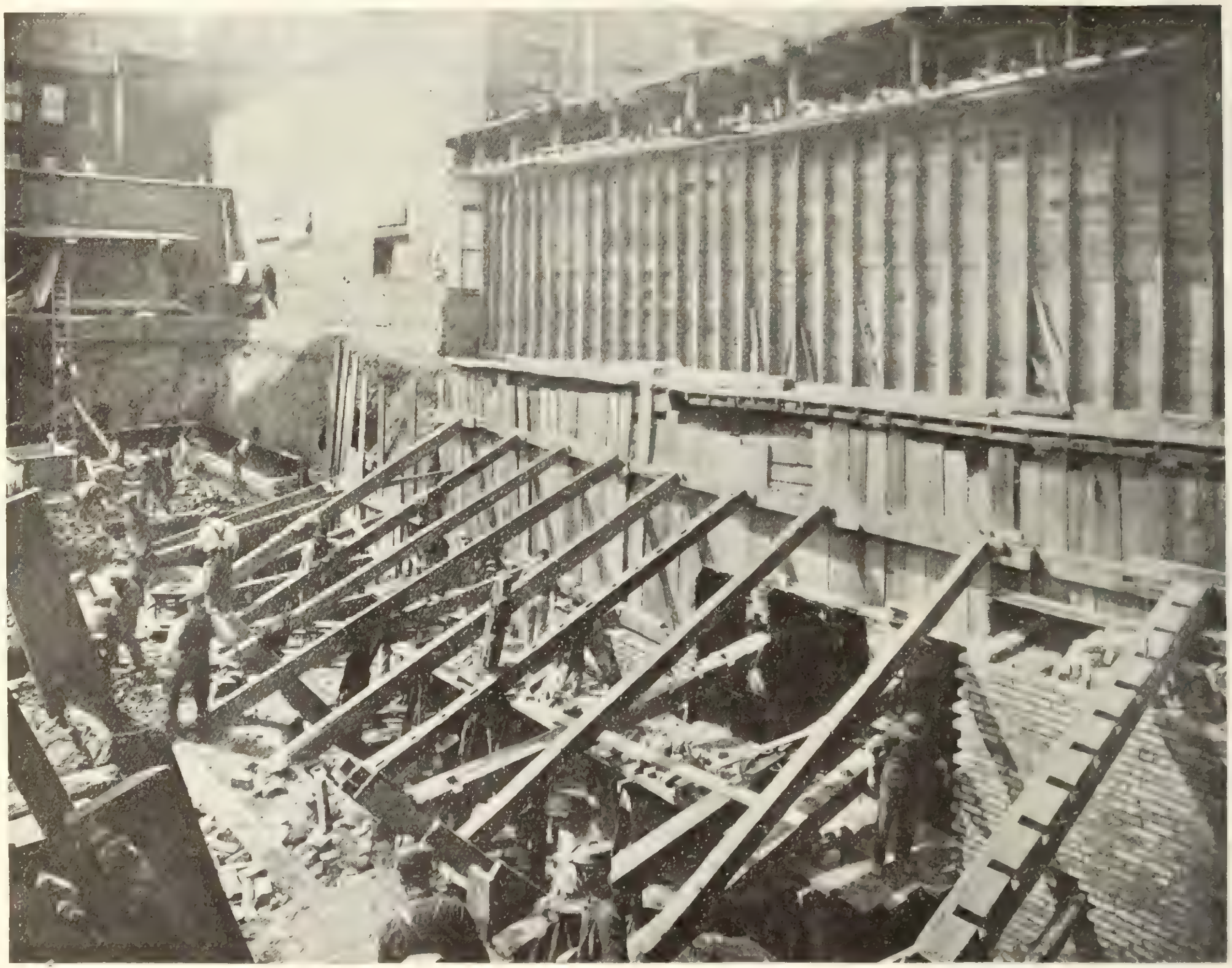
For Engineers' Handbook and full details regarding Prices and LOCAL STOCK ON HAND, address any of above offices

Let Us Tender on Your Roofing and Waterproofing Specifications

We supply roofing, waterproofing and insulating materials of all kinds and undertake contracts for roofing and waterproofing, our complete equipment enables us to execute the work in accordance with Architects' and Engineers' specifications.



Foundations of Marcus Loew's New Theatre, Toronto.

General Contractors, Fleishmann Bros., Toronto. T. H. Lamb, Architect, New York City.
Makepeace & Makepeace, Associate Architects, Toronto.

Our work on many notable Canadian buildings is a guarantee of our ability to successfully carry out the most important contracts.

The Waterproofing of the above foundation executed by:

Canadian Supply & Contracting Company, Ltd.

Structural Waterproofing Engineers and Contractors

Roofing, Waterproofing and Insulating Material

220 King St. W., Toronto

GOODYEAR

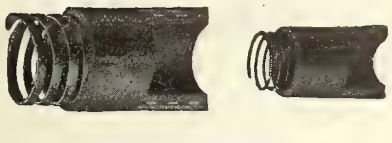
HOSE

For Greater Protection---For Longer Wear

¶The Goodyear Hose-making equipment is the most up-to-date in Canada. We have the latest improvements known to the trade. Every process is under the control of experts, who know the Goodyear requirements and see that a uniformly high standard of quality is kept up.

¶We take no chances with the raw materials. A stringent laboratory examination determines the quality of the raw rubber. The hard long-fibre cotton which is specially woven for Goodyear Hose-making is submitted to tests for strength and weave.

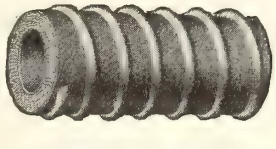
¶The walls of the hose are composed of long strips of cotton fabric thoroughly impregnated with rubber or friction. And cut on the bias to resist expansion, bursting and elongation. This friction-impregnated fabric is rolled under great pressure, which ensures a perfect union of the plies.



SUCTION HOSE

¶We build into Goodyear Hose the same strength and indestructibility as have made Goodyear Rubber Belts famous. Goodyear Suction Hose is steel-wound internally to guard against collapse. The coil is of round or flat wire, and round it the hose is built up, ply upon ply of rubber-permeated cotton fabric. This fabric is made from special hard-staple long-fibre cotton, and is cut on the bias to give strength and hard wear.

¶Goodyear Suction Hose is made for every purpose – and can be had rough or smooth bore. Is in service throughout Canada—on wrecking and dredging contracts—in factories and mines—on farms and in saw-mills. Special hose made for sand-sucking, oil, gasoline, vinegar and acid, wine, etc.



STEAM HOSE

¶Steam Hose gets more hard usage than any other hose. In the Boiler Room it lies around near the furnace and is scorched—a hot firing tool is carelessly thrown down upon it—oil is spilt over it.

¶Goodyear Steam and Hot Water Hose is made with special heat resisting lining, which keeps the extreme heat from the friction fabric. This gives the extra durability—it will stand up well under hard usage. In its manufacture the materials undergo special treatment to resist oil—so destructive to common hose. The rubber and duck used in Goodyear Steam Hose are specially tested for service under high pressure of steam and hot water. We supply it steel wire wound or marline jacketed.

THE GOODYEAR TIRE & RUBBER CO. OF CA
THE GOODYEAR TIRE
THE GOODYEAR TIRE & RUBBER CO. OF CA
THE GOODYEAR TIRE

GOODYEAR MILL HOSE

¶When Mill Hose is wanted it is wanted badly. To find that your Mill Hose has cracked and rotted while lying idle is serious. **"Goodyear Underwriters"** is always ready for effective service. We build this hose to meet the requirements of the Associated Factory Mutual Fire Insurance Companies. It bears the required stamp of approval "tested to 200 lbs. pressure." The inner tube is made from NEW Rubber of the highest grade, uniform in thickness and quality. The cotton fabric is of special circular web woven to the Underwriters' specifications for a minimum of expansion or elongation under pressure. It is antiseptically protected against rot and mildew.

¶For Factories and Mills the "Goodyear Underwriters" is a hose which will lower insurance rates, and cannot be excelled in durability and strength. You see it everywhere—the hose with the black and yellow stripes.

GOODYEAR RUBBER HOSE

AIR HOSE

¶With fair usage Goodyear Air Hose will be found proof against internal decay from oil—breaking away of pieces of the tube—and clogging of the machinery. The lining is made from selected rubber and cured to prevent hardening from the heat and pressure.

¶ Goodyear Air Hose will give good service under intermittent pressure.

¶ In mines, engine and boiler works, steel construction contracts—wherever pneumatic tools are being operated you will find Goodyear Air Hose. Wire or marline winding or marline jacket.

112

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The Third International Road Congress

DURING recent years no subject has assumed greater importance with municipal authorities than highway construction and maintenance. The most convincing evidence of the truth of this assertion was provided in London, Eng., on the occasion of the Third International Road Congress (June 23-28) reported elsewhere in this issue.

Within the last decade, self-propelled traffic has called for new methods of construction, while the cost of maintenance has advanced by leaps and bounds. Immense strides have been made in both construction and maintenance since the Brussels Congress in 1910, and the years which have intervened have been consistently progressive. Especially has this been so in connection with the bituminous treatment of roads, which has advanced from the experimental to the practical stage in an inconceivably short space of time. And this improvement has not been confined to one or two countries. The whole civilised world has been experimenting in the field of road reform, and the fact that no less than thirty-nine Governments appointed delegates to attend the London Congress bears striking testimony to the international character of the movement. Papers were contributed by engineers from Canada, the United States, Great Britain, Australia, Germany, Austria, Belgium, Denmark, France, Hungary, Italy, Russia, Holland, the Argentine, Switzerland, Egypt, Bulgaria and Monaco.

Meetings such as the London Congress have been criticised as being fruitless in regard to technical achievement. These international road conventions, however, are arranged primarily with the idea of affording engineers the world over the opportunity of comparing notes, and in this respect the London Congress, attended as it was by upwards of three thousand engineers from all parts of the globe, was singularly successful.

Having regard to the polyglot nature of the assembly and the wide range of subjects discussed, it is not to be expected that any one congress can arrive at definite conclusions in the various branches of highway engineering. The divergence of opinion among the representatives of one nation alone would render such conclusions improbable, and when some forty nations are engaged in lively discussion in three "official" tongues, the impossibility becomes apparent. The London Congress can but do what its forerunners have done and that is provide a mass of material for engineers to wrestle with pending the next gathering. Much that is presented in the form of papers at these congresses may be summarily dismissed from consideration as being of no importance; much is merely ephemeral, or of local application only; but there is always a residuum of sound material deserving of the earnest attention not only of the engineer but of all engaged in the administration of our roads.

There can be but one result from these periodical meetings, and that must be beneficial. The universal interest awakened must stimulate the energies of engineers the world through, while the friendly rivalry encouraged among divers nationalities will work wonders both in perfecting existing systems and in creating new and improved methods.

The ultimate aim of these Congresses is necessarily the perfect road. This attained, further deliberations may cease for all time. The perfect road, however, is not to be found outside Utopia, and interest in road congresses will not cease until such time as humanity takes finally to the air as a medium for locomotion.

Much might be said anent the receptions and entertainments, which were enjoyed to the full by the Canadian delegates and those from the United States. For most of us, at any rate, it was a red-letter day to be entertained within the historic precincts of the Guildhall and to be received by the Lord Mayor and the Corporation of the City of London It is not an everyday occurrence, either, to visit Windsor Castle upon the invitation of His Majesty the King. But these things, perhaps, will provide subject matter for a later chapter, it being the intention of the editor in the material published in this issue to present a timely and concise account embodying such notes as will be found generally informative by the technical man.

A Wider Interest in Sanitation Required

THE inhabitants of this vast continent have been a spendthrift people. That they should be is very natural. In any large area not thickly peopled and teeming with wealth, there is bound to be no husbanding of resources. In smaller and more densely crowded regions the sustaining of life makes necessary a utilization of every available product. Of no wealth has the world been more improvident than of the asset expressed in human life. This improvidence has manifested itself not only on fields of blood, but in our lack of knowledge of the laws of sanitation, our indifference concerning their acquisition, and our lethargy in conforming to those coming within the range of our information.

To the medical profession and to the civil engineer, we owe a great debt. Theirs has been a hard struggle and the battle is but begun—a battle against the superior ignorance of those who refuse to be taught and the prejudice of those who interpret the efforts of the two professions, as being just a fad affording another opportunity to squeeze money out of the unsuspecting. Humanity has to be saved from itself in spite of itself.

In the larger cities, of necessity, there must be considerable attention to sanitation. Not because of any superiority on the part of the citizens, but because each must live in proximity to his neighbor and accumulations of vegetable refuse, of litter and of the wastes of life soon become a nuisance and their removal is demanded. Moreover, the rapidity with which disease spreads in crowded localities, the high mortality rate arising from enfeebled resistance through over-crowding, impure air, confinement and often improper nourishment, has taught city officials the need of effective sanitation. But in the face of the best intentions and efforts there is much to be desired. In the smaller urban communities and in the rural districts danger arises from the fact, that the privilege of larger space afforded each citizen permits the continuance of the accumulation unmolested, perhaps throughout the whole summer season, thus furnishing a breeding ground for disease bearing insects and a culture for pathogenic germs.

There is much to be accomplished. A knowledge of the science of the preservation of human life must be more generally spread. It should be known that the house mosquito, one of many species, develops in all forms of standing and filthy water, both indoors and out; that the larvae feed upon the micro-organism found therein and that the fluid injected into the body when the house mosquito bites is a salivary distillation from this filth. It should be pointed out, that the common house fly is by some called the typhoid fly; that it spreads disease; that it has a power of regurgitation which enables it to eject the content of its stomach upon any substance it wishes to dissolve, and that this ejected fluid may have been gathered in any filthy matter impregnated with disease-causing bacteria. Householders should know the dangers of heaps of decaying vegetation and piles of animal litter. Civic officials and gardeners should be acquainted with the fact that faecal matter merely trampled into the dust or spread upon the fields to dry does not destroy the germ life, but merely leaves it to be scattered broadcast with every wind. Sanitation is a most important science.

The work of arousing a wider spread interest in this subject may be accomplished by a variety of agents acting in conjunction, education by means of schools, by lecturers engaged by the Provincial Board of Health, through the efforts of the local doctors and by pamphlets sent out to the public in larger numbers. A step forward was taken when the province of Ontario was divided into health districts. These districts might be reduced in size and hence increased in number and a permanent expert placed in charge of each. By this means the local medical officer in smaller communities could be largely relieved of his duties, as dependence upon the locality for medical practice militates against efficiency. There must be continued work on the part of engineers to provide reasonable and effective garbage destruction and sewage disposal in less thickly inhabited districts. Not the least important factor in safety is the hearty co-operation of the people to be benefitted.

Improved sanitation will cost money. The state of New Jersey spent $350,000 to drain 400 square miles of salt marshes and saw results before the work was half done, in the greatly diminished mosquito pest. If the taxpayer once becomes seized of the fact, that increased care and cleanliness tend to greater physical comfort and better health, to greater business efficiency and longevity, the money will be forthcoming.

Important Railway and Civic Projects

THE confidence of Sir Thomas Shaughnessy, president of the Canadian Pacific Railway, in Canada's ability to pass through the present stringency without serious result is most marked. Speaking of the present conditions, he says: "So long as immigration continues at the present rate, the highest ever known, Canada's progress cannot be retarded". In fact, he forecasts that in two years from now there will be even more accelerated expansion.

The president of this great corporation claims that there has been no over-expansion in Canada and points out that in the matter of steel rails alone the Canadian manufacturers, while able to supply a large quantity, were not able to meet the demand, and this necessitated the purchase of 45,000 tons from American makers. The company is in a very strong position financially. The recent issue of $105,000,000 of common stock will give plenty of available cash and their land assets are enormous and increasing in value. At the present time the Canadian Pacific Railway has 1,800 miles of road under construction and $75,000,000 of equipment placed. Added to the large sums involved in these operations comes the announcement of the intended expenditure of $100,000,000 in the coming year. This sum is intended to cover railway extension, the building of hotels, steamers and rolling stock. These undertakings are rendered necessary by the increased growth and demands of the Dominion.

The railways and the city of Toronto have at length arrived at an agreement with regard to the viaduct. The work involved in the harbour improvements and the construction of the Esplanade viaduct and the new Union Depot will now be pushed vigorously. The city itself has plans for extensive municipal improvement. The waterworks pumping and distributing plant is to be extended; a drainage system for North Toronto and Moore Park is to be installed; the filtration is to be enlarged and a garbage and refuse disposal plant to be built. In all there is to be an immediate expenditure of about $100,000,000 in the provincial capital in the construction of large works by the city and the railways.

The confidence manifested in these projects and the magnitude of the expenditure involved should go a long way to remove any feelings of hesitancy or uncertainty regarding the immediate future. As we pointed out in our last issue, these undertakings should provide sufficient labor both in manufacture and construction to prevent any serious check to Canada's trade and expansion.

THE Provincial Government of Ontario is entering upon a new field of operations. An asylum composed of a large group of important buildings is under way at Whitby, Ont. It was found impossible to procure an acceptable roofing tile within the province. For the purpose of meeting this requirement and providing the necessary brick for public buildings an extensive factory is being opened at Mimico by the Department of Public Works.

The Third International Road Congress

Great Gathering of Highway Enthusiasts at the World's Metropolis—Delegates of Forty Nations Present—Canada and the U. S. Well Represented

(Staff article direct from the Editor)

London, Eng., June 28, 1913.

THE Third International Road Congress was inaugurated at the Central Hall, Westminster, London, Eng., on June 23rd, and many hundreds of delegates, representing governments and institutions from all parts of the civilized world, attended. The Congress, of which the King was Patron, was held in London by invitation of the British Government, and was organized by a council elected from numerous bodies, administrative, scientific and professional, interested in the roads of this country, with Sir George Gibb, chairman of the Road Board, at its head, Lord Montagu of Beaulieu, Mr W. Joynson Hicks, M.P., and Mr. F. H. Berryman as its vice-chairmen, the Hon. Arthur Stanley as hon. treasurer, and Mr. W. Rees Jeffreys as hon. general secretary. The council acted in co-operation with the Permanent Committee of the International Commission of Road Congresses. An exhibition of road-making appliances and materials and held concurrently with the Congress and a large number of interesting excursions, visits to works and so forth, was planned not only for the Congress week but for the preceding and following weeks.

Canadian and U. S. Members

Canada and the United States were well represented, as may be gathered from the following names taken from the membership list:

Balch, W. H., M. Am. Soc. C. E., Director-General of Public Works, San Domingo.
Bellisle, J. A., Secretary of the Hon. C. R. Devlin, Quebec.
Blanchard, A. H., Professor of Highway Engineering, Columbia University, New York City.
Bowman, H. J. (Berlin, Ont.), Canadian Society of Civil Engineers, Montreal. Delegate of the Society.
Carpenter, H. S., Superintendent of Highways, Saskatchewan.
Church, S. R., Manager, Research Department, Barrett Manufacturing Co., New York City.
Clarke, A. R., Ontario Motor League, Toronto.
Cochrane, Hon. Frank, Minister of Railways and Canals, Ottawa.
Cook, J. H., Montgomery, Alabama. Delegate of American Automobile Association.
Cornell, Col. E. S., New York.
Crosby, W. W., Consulting Engineer, Baltimore.
Darlington, N. D., Los Angeles, California.
Devlin, Hon. C. R., Minister of Colonization, Quebec. Delegate of Quebec.
Durham, H. W., Chief Engineer of Highways, New York. Delegate of New York.
Fletcher, A. B., Highway Engineer, California.
Fuller, A. H., Professor of Civil Engineering, University of Washington, Seattle.
Gillette, H. P., Consulting Engineer, Chicago.
Goodsell, D. B., Assistant Engineer, Department of Public Works, New York.
Haag, J., Secretary, Board of Estimate and Apportionment, New York City.
Hill, S. Delegate of American Road Builders' Assn.
Kennedy, E. J., Boston, Massachusetts. Delegate of American Automobile Association.
Kenyon, C. A., Indianapolis.
Laing, A. T., University of Toronto, Toronto.
Lewis, N. P., Chief Engineer, Board of Estimate and Apportionment, New York City.
McLean, W. A., Member Canadian Society Civil Engineers, Chief Engineer Department of Public Highways, Toronto. Delegate of Ontario.
Nelson, G. A., Decatur Chamber of Commerce, Alabama. Delegate of Chamber of Commerce.
Page, L. W., President of American Highway Association, Washington.
Rehill, J., Superintendent of Construction, Maryland State Roads Commission.
Sharp, C. H., Electrical Testing Laboratories, 80th St., New York City.
Smith, F. P., Chemical Engineer, East 23rd street, New York City.
Stone, W., Manufacturer, Oakville, Ont.
Thomson, R. H., Chief Engineer, Strathcona Park Government Building, Victoria, B.C.
Tillson, G. W., Consulting Engineer, Offices of the President of the Borough of Brooklyn.
Travilla, J. C., Commission of Highways, St. Louis.
Turner, H. A., Road Superintendent, Okanagan Valley, British Columbia.
Washington, W. DeH., New York. Delegate of State of New York.

Inaugural Ceremony

The Chancellor of the Exchequer presided at the inauguration, and in a short characteristic speech welcomed the delegates He claimed that the roads of England were the best in the world. With the coming of the railroads, many of the roads of the country had fallen almost into desuetude. Then came the great revolution effected by the pneumatic tire, and road-making became once more an important social, economic and financial question. In 1892 the roads of England and Wales cost $42,500,000 to maintain; twenty years later they cost practically double.

Sir George Gibb, in expressing to the Chancellor the thanks of the Congress for his welcome, referred to the great improvements which had been effected in road-making since the Brussels Congress of 1910. Dust might be said to have been conquered, for it did not exist to any appreciable extent on roads which had been properly treated with tar or bitumen. In Great Britain the general trend of engineering opinion was undoubtedly in favor of the use of tarry or bituminous substances in road-making, and in England, perhaps to a greater extent than in any other country, macadam so treated had, not only experimentally, but definitely and practically, taken the place of water-bound macadam for roads of any importance.

Addresses and responses to the welcome were delivered by M. Preadeau, president of the Permanent Committee of the International Commission, and by representatives of the Governments of Canada, the United States, Germany, Austria, Hungary, Belgium

France, Italy, Monaco, Holland, Norway, Russia, Spain and Switzerland.

The 1916 Congress

Herr Lewald, on behalf of the German Government, extended a cordial invitation to the Commission to hold the next Congress at Munich in 1916. This invitation was warmly endorsed by the head of the Bavarian delegation, and Sir George Gibb announced that the council had that morning discussed the invitation and recommended its acceptance.

Mr. W. DeH. Washington said that he had come there to bring them the invitation of the Governor of New York State to hold their meeting in the United States, and he would have brought the invitation of the President, but for a rider in a bill which forbade the President to send delegates to any international congress. In the States they were deeply engaged in the work of road-building The State of New York was now ready to spend a sum of nearly $100,000,000—perhaps the largest public expenditure possible in the world to-day, and they had come to England to hear all they could, and he was sure they would gain in their endeavor to make smooth the path of humanity. In building good roads they were working for man and for God. They had 2,200,000 miles of roads in the United States, but only 190,000 miles had been improved.

Later in the day, the Exhibition was opened by Earl Beauchamp, H. M. First Commissioner of Works, President of the Exhibition Committee, while in the evening the members of the Congress were received at the Guildhall by the Lord Mayor and Corporation of the City of London, some 2,400 guests being present.

Proceedings of the Congress

Opening, as has been said, on June 23rd, the Congress continued until June 28th. The programme was a full one every day, and lasted from ten o'clock in the morning until often quite late at night. Practically only three days were devoted to actual business (in the way of discussion of the papers and reports submitted) the remainder of the time being spent in visits, excursions, receptions, and the inevitable final banquet, which last-named was given at the Hotel Cecil and followed by a full reception.

The papers and communications submitted for the consideration of the Congress embraced a wide variety of subjects, but it was somewhat difficult to understand precisely what constituted a "paper" and what a "communication." The only difference between the two appeared to be (according to the official programme) that whereas the discussion of questions was compulsory, the discussion of the communications was qualified by the phrase "if time permits." The following are the headings of these questions and communications:

Questions

1. Planning of new streets and roads.
2. Types of surfacing to be adopted on bridges, viaducts, etc.
3. Construction of macadamized roads bound with tarry, bituminous, or asphaltic materials.
4. Wood paving.
5. Methods of lighting public highways and vehicles.
6. Observations noted since 1908 as to the various causes of wear and of deterioration of roadways.
7. Regulations for fast and slow traffic on roads.
8. Authorities in charge of the construction and maintenance of roads, functions of central authorities and local authorities.
9. Finance of the construction and upkeep of roads—provision of revenues.

Communications

1. Improvements adopted since the second Congress in machinery used in the construction and maintenance of macadamized roads.
2. Tests of materials used in the construction of macadamized roads.
3. Construction of water-bound macadamized roads.
4. Technical and economic study of the comparative advantages of different types of roads.
5. Various types of stone paving in use.
6. Direction and distance sign posts.
7. Development since the second Congress of self-propelled public service vehicles.
8. Qualifications of engineers and surveyors in charge of the construction and maintenance of roads—wages and conditions of service of foremen and roadmen.
9. Statistics of cost of construction and maintenance.
10. Terminology adopted or to be adopted in each country relating to road construction and maintenance.

It will be apparent that with no less than eighteen nations contributing, coupled with the fact that when a speaker used a language other than one of the three official languages of the Congress—English, French and German, to wit—his words had to be translated forthwith, there was some little confusion in the discussions. The time was short enough as it was, and to cut it still shorter the discussion at each meeting was preceded in the case of each question by a brief summary of all the papers to be considered in such section. Properly, to follow the whole of the proceedings, a man would have had to possess a distinct dual personality—two meetings being held at different places at the same time—to know thoroughly three languages, to have a nodding acquaintance with half a dozen more, and to be able to take a rapid shorthand note in all of them. Happily for the peace of mind of our representative, the discussions were not of the highest importance, the cream of what was really valuable being set down in the 123 papers and communications which were printed and circulated among the members before the commencement of the actual business of the Congress and in the resolutions which were put to each meeting. Some explanation of the procedure is perhaps necessary here. In the first place, certain papers are submitted to a Congress, and are then printed and circulated, so that those attending may prime themselves in order to be able to join in the discussions. The papers duly discussed, certain resolutions (based to some extent upon the discussions) are put to the meeting and are adopted or not, with or without amendment, as the case may be. These resolutions, it must be noted, apply only to the nine "questions" submitted and not to the commmunications. In our next issue we shall give the full text of the resolutions, and we hope to present our readers with an intelligent abstract of the more valuable of the papers and communications submitted. Some of the papers we shall necessarily publish in extenso, but there will be a vast overplus, dealing in the main with foreign practice, which, like the curate's egg, will be found to be good only in parts. This overplus will be severely cut and precised, in order that there may be no undue waste either of our space or of our readers' time.

Visits and Excursions

A great number of these were arranged for the Congress week and the weeks preceding and following, the price per head per attendance ranging from one shilling to ten pounds. Strangely enough the shilling excursion—it was really a free excursion and the shilling was for "registration fee"—was that to Windsor by special train, where the members visited the historic Windsor Castle and were entertained to tea in the Castle grounds by the King. Other visits during the Congress week were to the Garden City at Letchworth, the Marconi Wireless Works, the National Physical Laboratory at Teddington, and Hampton Court Palace. There were also various inspections of roads in the "Home Counties," by which terms the counties continguous to London are known, and other parts of the country. Trips were arranged for Eastbourne, Brighton, Folkstone, Chester, North Wales, the Midlands, the English lakes and Scoltand for the week following the Congress, and in every case a series of interesting visits had been planned, with receptions and so forth galore.

Mention has already been made of the reception at the Guildhall on the opening day and of the final banquet and reception at the Hotel Cecil. Other receptions and conversaziones were those at the Albert Hall, by invitation of the Institution of Civil Engineers, at the Royal Horticultural Gardens (a garden party) by the Surveyors' Institution, and at the Royal Automobile Club by the Committee of that Club.

Foremost among the excursions was the daily one, spread over the whole three weeks, to the typical roads through South London and the trial lengths laid in various materials by the Kent County Council under arrangement with the Road Board, in 1911. There were 23 of these trial sections, and an interesting Interim Report of the behaviour of the materials and methods represented by these has been published by the Road Board That the test to which these have been subjected is a severe one is evidenced by the fact that a traffic census taken in August last year recorded an aggregate weight of 3,547 tons per day.

Exhibition of Road-Making Appliances and Materials

A comprehensive exhibition of road-making appliances and materials ran concurrently with the Congress. It was international in character, and was undoubtedly the most representative exhibition of its kind that has ever been held in England. The exhibits were divided into two broad sections, materials and light machinery being shown at the Royal Horticultural Hall, Westminster, and heavy machinery on adjacent ground in Vincent Square. We propose to give just what notes space will allow upon the more important of the exhibits.

Binders, Grouts and Asphaltes

Bituminous binders were well to the fore and mention may be first made of "Camarco," (The Canadian Mineral Rubber Company) a material peculiarly suited to the formation of asphaltic macadam. It is introduced as a binder for the actual road metal, and may also be used as a top dressing for water-bound macadam roadways. The Anglo-American Petroleum Products Company market under the names of "Mexphalte" and "Fluxphalte" two materials refined from Mexican bitumen. Mexphalte has good cementing powers and is used largely in the grouting or mixing method, while Fluxphalte has been designed to supersede tar as a dressing. "Tarco" (R. S. Clare & Company) is a material for surface treatment, "Bi-Tarco" for tar macadam manufacture, while "Bituflex" and "Solta" (Standard Tar Co.) form binders and dressings. Asphaltes were represented by the Val de Travers and the Limmer Companies, while midway between asphaltes such as these and the bituminous binders may be placed "Roadamant" (made by the company of that name) composed of Rock asphalte, bitumen and granite chippings, (applied as a road carpet) and "Cormastik" (The British Trust Corporation) a bituminous road covering, composed of granite chippings, sand, rock asphalte and cement. "Ferromac" (Roadite Ltd.) and "Rocmac" (Rocmac Ltd.) are distinct from the foregoing inasmuch as they are not of a bituminous nature. Ferromac consists of a special cementitious powder and two chemical solutions, and the resulting mixture will, it is claimed, thoroughly bind all broken stone and leave a hard, waterproof, non-slippery surface. Rocmac is described as "silico-saccharate-carbonate" and makes much the claims of the other material. Both are largely and successfully used in England.

Granite and Reinforced Roads

"Clinton Fabric" is a steel wire mesh, made by the British Reinforced Concrete Engineering Company for the reinforcement of road foundations. Among the company's exhibits were two sections of concrete foundations: a 12-in. plain concrete and a 5-in. reinforced. The reinforcement serves to carry the road over soft spots, prevents cracking, and acts as a weight distributor. "Durax" stone, laid on the system of the continental "Kleinpflaster," formed an interesting exhibit, but the material is too well known to our readers to need description.

Mixers, Boilers and Sprayers

Five exhibits may be noticed under this head: the tar and bitumen macadam mixer of the Ransome-ver-Mehr Machinery Company, which may be worked in combination with the firm's stone dryer; the "M.S." tar and bitumen boiler and stone drying and coating machines (Murphy, Steadman & Co.); Johnston's double furnace tar boiler, with preliminary heater, and Waithman's reservoir tarring apparatus for hand-painting; the automatic pressure tar spraying machine and various types of painting machine of W. Weeks & Son; and the spraying and spreading machines and boilers (including the "Farnham" hand spreading machine) of the Phoenix Engineering Company.

Road Rollers

The exhibits in this section were specially good, with no less than six firms contributing. Petrol-driven rollers were much in evidence, together with a number of handy machines of a light type for tar-macadam work. Special mention may be made of the patching roller (with a short wheel base) of Mann's Patent Steam Cart & Wagon Company and the water ballast roller (workable by petrol or paraffin) of Barford & Perkins. The other firms were Aveling & Porter, Clayton & Shuttleworth, Thos. Green & Son and Ruston Proctor & Company, all makers of machines of the highest grade.

Sundry Machinery and Appliances

A few words must now suffice, owing to pressure of space. Stone-breaking machines were exhibited by Hadfield's Steam Foundry Company, H. R. Marsden, and the Patent Lightning Crusher Company. An excellent type of motor street-sweeping broom was shown by Thomas Green & Son, while outside the hall one of J. & P. Hill's motor vacuum road-cleansing machines (which are now largely used on the Continent) was at work. An exceedingly interesting exhibit was that of A. C. Wells & Company, consisting of appliances for drying road surfaces before pitch grouting and for warming asphalte or similar surfaces before applying sealing coats.

(Concluded in next issue)

Personal and Other Notes From the London Road Congress

(By the Editor)

Lord Montagu of Beaulieu, one of the vice-chairmen of the organizing council of the Third International Road Congress, held recently in London, Eng., and reported elsewhere in this issue, is one of the most prominent men in the good roads movement in England. He is well known as the founder and editor of The Car, and he is the President of the Association of Bituminous and Other Paving Manufacturers. He has taken a keen interest in the betterment of the condition of highways, while he has followed with untiring zeal the developments in all transport matters. At Oxford University he is stated to have been "prominent in athletics, engineering and science."

Sir George Gibb, who filled the distinguished office of General President of the Third International Road Congress, is Chairman of the Road Board, in which capacity he has to allocate over the United Kingdom for the purpose of road improvements the sum of approximately $6,250,000 annually. He is a solicitor by training and profession and was formerly a managing director of the North-Eastern Railway Company and Chairman of the Metropolitan District Railway Company. In the important government department which he now controls, he has made a great reputation for himself as an administrator. He has awakened great enthusiasm in good roads in England, a country which possesses some of the oldest and best highways in the world.

Sir Herbert B. Mackworth-Praed, Bart., was one of the most active members of the General Committee of the London Road Congress. He was one of the organizers of Taroads Syndicate, Limited, a company which possesses a fleet of tar-spraying machines, which annually spray with tar the surface of many hundreds of miles of highways in England. Last year he formed the Praed Road Construction Syndicate, Limited, to undertake the bituminous construction of roads.

Sir Maurice Fitzmaurice, C.M.G., formerly Chief Engineer to the London County Council, but now in private practice, was one of the most effective workers on the Executive Council of the Third International Road Congress. He was one of the two representatives of the Institute of Civil Engineers, Mr. Alexander Siemens being the other. Sir Maurice will be remembered as a former contributor to this journal, he having been the author of a detailed description of the Rotherhithe tunnel work, published in our issue of April 24th, 1912.

The Right Hon. Earl Beauchamp, K.C.M.G., H.M. First Commissioner of Works, received the members of the Third International Road Congress at the opening session in London. Earl Beauchamp was President of the Exhibition Committee, whose activities and enterprise were reflected in the representative machinery and equipment show at the Royal Horticultural Hall.

Mr. W. A. McLean, Provincial Engineer of Highways for Ontario, was ubiquitous at the Road Congress in London. The editor of this journal had the pleasure of meeting him at the Surveyors' Institute, Westminster, in company with Mr. E. L. Powers, Editor of Good Roads, New York. Mr. McLean was one of those who contributed a paper on the construction and maintenance of roads, in particular relation to administrative methods and the functions of central authorities. As evidence of the international character of the Congress it may be of interest to state that in this department alone communications were received from representatives of Canada, the United States, Great Britain, Germany, Belgium, Bulgaria, France, Austria-Hungary, Italy and Russia.

Messrs. W. A. MacLean, H. S. Carpenter, W. G. Trethewey and H. T. Bowman were among the Canadians who attended the reception of Members of the Third International Road Congress by the Lord Mayor and Corporation of the City of London at the Guildhall on June 23rd. It is of interest to recall that many of London's most historic associations are connected with the Guildhall. The building is the scene of an annual banquet to the Members of His Majesty's Government. It is here, too, that foreign potentates and other distinguished persons are entertained on the occasion of state visits to the city. Many scenes and incidents, of course, in the past history of the city, are intimately connected with this imposing building. It was here that the Duke of Buckingham assembled the citizens in 1483 and induced them to pass over the children of Edward IV. and to elect Richard of Gloucester as King. Here, too, in the 16th century, the trial was held of Lady Jane Grey and her husband, Lord Dudley, with Archbishop Cranmer and others. Perhaps the most important historical fact of all, however, in the history of the Guildhall was the election here of William, Prince of Orange, to the British throne, an event which took place in 1688.

Mr. Samuel Hill, of Seattle, President of the American Road Builders' Association, entertained the members of the Third International Road Congress to dinner at the Hotel Metropole, in London, on Thursday, June 26th.

Mr. W. Rees Jeffreys, Honorary General Secretary of the Third International Road Congress, entertained the members of the Congress at an At-Home on Sunday, June 22nd. The reception was held at Mr. Jeffreys' beautiful country seat at Guildford, Surrey. Many Canadian and United States delegates attended.

Mr. Francis Wood, M. Inst C.E., Borough Engineer and Surveyor of Fulham, London, Eng., was awarded the Prize of the Second International Road Congress held in Brussels, 1910. The announcement was made at one of the inaugural meetings of the Permanent International Commission. In making the announcement, Mr. Mahieu, General Secretary of the Executive Committee, expressed his gratification that the award to an English engineer should coincide with the opening of the London Congress.

The Fourth Congress will be held at Munich in 1916, on the invitation of the Federal Government and the Royal Bavarian Government.

An enterprising feature of the Third International Road Congress was an official journal printed in English, German and French, and issued daily to all members.

Galt on Saturday will vote on a by-law to raise $70,000 for waterworks extensions. The mistake common to growing towns and cities was made of providing inadequately for the future in the original plans. The new 18-inch main contemplated for the older part of the town will cost one-half the sum mentioned, and the balance is needed to extend the service to newer districts.

It is pointed out, to overcome opposition, that the by-law will not add a cent to the general taxes, and that the debentures will be fully taken care of by waterworks revenue.

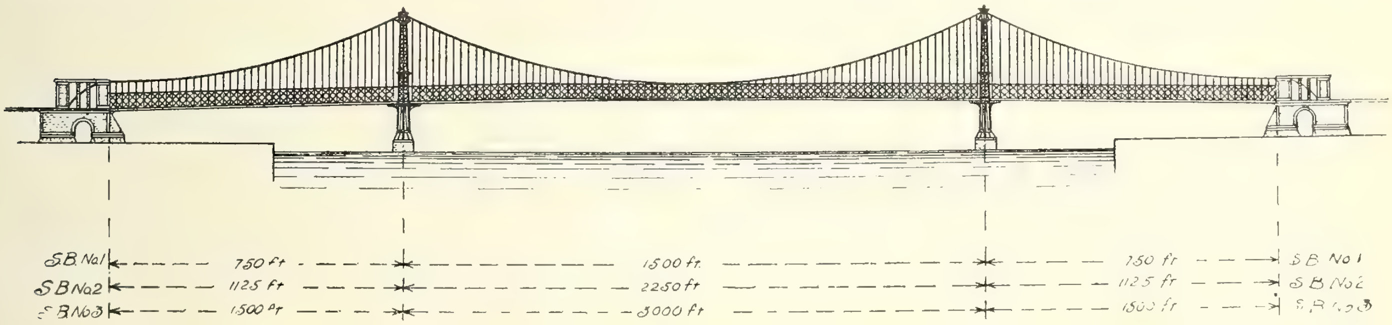
Suspension and Cantilever Bridges[*]

Limit of Each—Types of Suspension Bridge—Cost and Maximum Span—Greatest Practicable Span—Cost and Conclusions

At the annual Congress of Engineering and Scientific Societies held in Spokane, Wash., in February, a discussion by Prof. D. B. Steinman, University of Idaho, of span lengths of cantilever and suspension bridges merited particular attention. We print the discussion in full as follows:

Each type of bridge construction has some limiting span-length which it cannot exceed. This "limiting span" may be defined as the length at which the ratio of the intrinsic weight to the applied weight becomes infinite. In other words, it is the length at which the structure would be just capable of holding its own weight without carrying any live or moving load, any attempt to increase the load resulting in members of infinite cross-section. Under the stress of necessity, the span of any type of bridge may be pushed as close as may be desired to this theoretical limit; but this can be done only at a very great sacrifice of economy, as the cost of the structure increases very rapidly when the span approaches the limiting value.

The longest span at which the cross-sections of the principal members will not exceed an assigned maximum value, determined by the limitations of design, fabrication, transportation and erection, will be termed maximum span. The length of the maximum span for any form of bridge may be determined with sufficient definiteness from theoretical considerations applied to the data of actual designs; but it must be borne in mind that the results of such determination are subject to expansive revision when the methods of design or the materials of construction undergo improvement.



General elevation of suspension bridges employed in comparative study of span length.

In addition to the above span-limits, each bridge type has an economic range of spans, within which it will be less costly than any other form of construction. If, for any two comparable types of structure, a span of equal cost be determined, that span will be the inferior economic limit for one of the bridge-types and the superior economic limit for the other.

The term economic span will be used to designate the limit above which the cost of a bridge would exceed the capitalized value of its usefulness to the builders. Although this is a problem of great practical significance, it does not readily lend itself to accurate treatment in any general manner on account of the large possible variations in local conditions, such as the magnitude and financial importance of the traffic expected, the cost of real estate for land spans and approaches, and the difficulty encountered in locating suitable foundations. By adopting the most favorable assumptions for these varying conditions, a maximum value for the economic span may be established.

The maximum and economic span-lengths for bridges of ordinary span have been fixed pretty definitely by the results of numerous designs and comparative estimates. We may take our values of these limiting lengths from the consensus of opinion among engineers as evidenced by their uniformity of practice. Thus the ordinary truss bridge finds its range of usefulness between the limiting spans of about 120 and 550 feet, there being but three truss spans exceeding the latter value. Below this range, the steel girder or concrete arch is more economical; above these limits the steel arch enters into competition. The latter construction, in turn, ceases to be economical at about 800 feet, although the proposed Hell Gate arch is to have a span of 1,000 feet.

For longer spans the selection of a bridge structure narrows down to a choice between the suspension bridge and the cantilever. The relative economy of these two forms of construction has long been a mooted question. Although comparative designs have been prepared in individual instances for the particular local conditions obtaining, the author has been unable to find any general comparison of the two bridge-types for the purpose of establishing their relative economic or limiting spans. He has therefore undertaken the determination of these values for the suspension and cantilever bridges, namely:

(1) The limiting spans, or the greatest spans which can be designed.

(2) The maximum spans, or the greatest spans which can be built.

(3) The economic spans, or the greatest spans which it would pay to build.

(4) The span of equal cost for the two types; in other words, the span at which the cantilever ceases to be economically superior to the suspension bridge.

The method proposed for the solution of these problems is to prepare designs and estimates of a wide range of cantilevers and suspension bridges and to deduce therefrom the laws of variations of weight and cost with length of span. The relations between span and weight, thus established, fix the limiting span for each form of construction. The cost curves of the two types indicate their comparative economy at different spans as well as the critical span of equal cost. Finally, an estimate of the maximum probable traffic returns, compared with the costs of different spans, determines the economic limiting length for each type.

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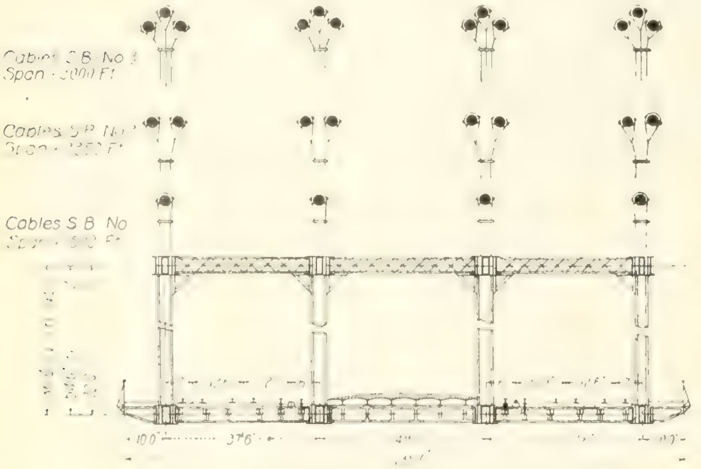
[*] Engineering and Contracting.

With the above objects in view, the author has prepared complete designs and estimates of three suspension bridges of 1,500, 2,250 and 3,000 feet span, and of three cantilevers of 1,000, 1,500 and 2,000 feet span respectively. To justify the large expenditure involved in structures of this magnitude, they will be assumed to be railroad bridges, with additional provision for electric cars, driveway and foot-walks, making a total live-load capacity of 18,000 lbs. per linear foot.



Cross section of suspension bridges.

The cost of a structure for a given span will, of course, be affected by local conditions such as prices of material, specified unit stresses, depth of foundations, etc. In order that the comparison between the cantilever and the suspension bridge may be an absolutely fair one, it is essential that all such arbitrary or varying factors be chosen with extreme care and be kept exactly the same for both types of construction. Furthermore, in order that the results for the limiting spans may be the true maximum values, it is necessary to carefully determine and use the most favorable proportions, material and form of construction for each design.

SUSPENSION BRIDGES

One of the first questions to be decided in the design of the suspension bridges was the choice between a steel-wire cable and a chain of eye-bars for the principal carrying member. The latter enables the bracing for the prevention of deformation under moving load to be incorporated in the cable system; the other requires a separate stiffening truss for the reduction of these deflections. Omitting from consideration the possibility of using the overhead bracing in conjunction with a wire cable—a construction which would combine the essential advantages of both systems but of which the feasibility has not yet been demonstrated, and without presuming to decide between the relative advantages of the two types of cable construction, the author adopted the "wire-cable type" in the present investigations for the following reasons:

(1) As both types are practically equal in cost, this choice would not affect the results for the economic lengths of span.

(2) As the wire cable affords a great saving in weight, it would yield a larger value for the maximum practicable span.

(3) As this choice conforms with the accepted past and present practice in suspension bridge design, and as no radical changes need be expected in the proximate future, the results obtained are better adapted for comparison with the data of existing structure and of greater value in estimating future designs.

The next question to be investigated was the economic ratio of cable-rise to length of span. By expressing the costs of the different parts of the structure in terms of this rise-ratio (n), the author found that the total cost of a suspension bridge of span l would be a minimum for n = ⅛ (very closely) for all spans from l = 1,000 ft. to l = 4,000 ft.

The depth of stiffening truss was next investigated. The minimum depth of truss is determined by the requirement of limiting the deflections so that the resulting gradient in the roadway should never exceed a specified amount (r), With r = 1 per cent. as a maximum limit, it may be shown that Minimum d/l = 1/45

By expressing the total weight of material in terms of the truss-depth, the economic depth of stiffening truss was found to be given by d/l = 1/40. This value is somewhat higher than the average of past practice, probably because most designs have been a compromise between the demands of economy and those of aesthetics. The Williamsburg Bridge is the only long-span structure conforming with the above economic ratio, but its appearance is undoubtedly marred by the excessive depth of the stiffening truss. For the purpose of this investigation, economy of weight and cost is of greater significance than any aesthetic considerations. The above depth-ratio is therefore adhered to, even at a sacrifice of appearance.

Estimate of Cost

In order to establish an equitable schedule of unit prices for the two types of bridges, a critical study was made of the different bids received by New York City for the Williamsburg, Manhattan and Queensboro bridges. These structures were selected as combining the qualifications of recentness of date with similarity of construction and magnitude to the designs under investigation. The prices of the successful bidders were adopted except where they differed so widely from the following bids as to indicate their having been unbalanced for some special reason. The unit prices determined by this comparison are incorporated in the following estimates of cost:

TABLE I.—PRINCIPAL DATA FOR DESIGN OF SUSPENSION BRIDGES.

	No. 1. Ft.	No. 2. Ft.	No. 3. Ft.
l = span . .	1,500	2,250	3,000
l_1 = side-span = ½ l ..	750	1,125	1,500
f = versed sine = 0.12 l....	180	270	360
f_1 = versed sine in side-span = f/4	45	67½	90
d = depth of truss = 0.024 l.. .	36	54	72

Type: Stiffening truss hinged at the towers. Suspension rods in side-spans

Loading.	Lbs. p. l. f.
4 railroad tracks at 3,000 lbs.	12,000
2 lines of cars at 1,000 lbs.	2,000
40 ft. of roadway at 75 lbs.	3,000
20 ft. of roadway at 50 lbs.	1,000
Total congested load	18,000

The total substructure, including all work in preparing for and installing the tower foundations and anchorages, $3,757,640. The steel work, including cables, suspended structure, towers and anchorages,

$7,887,300, or a grand total of $11,644,940 for the 1,500-foot span suspension bridge.

For the 2,250-foot span these figures are respectively $6,008,940 and $17,750,590, giving a grand total of $23,759,530.

The substructure for the 3,000-ft. span would cost $10,011,820, while the steel work would amount to $36,772,710, making a grand total of $46,784,530.

Empiric Formulas for Weights

From the results of the preceding designs, we may construct semi-empirical formulas for the weights of the different parts of a suspension bridge. Such formulas will be useful in preparing estimates for other spans and loadings; also in drawing general conclusions as to maximum and limiting spans.

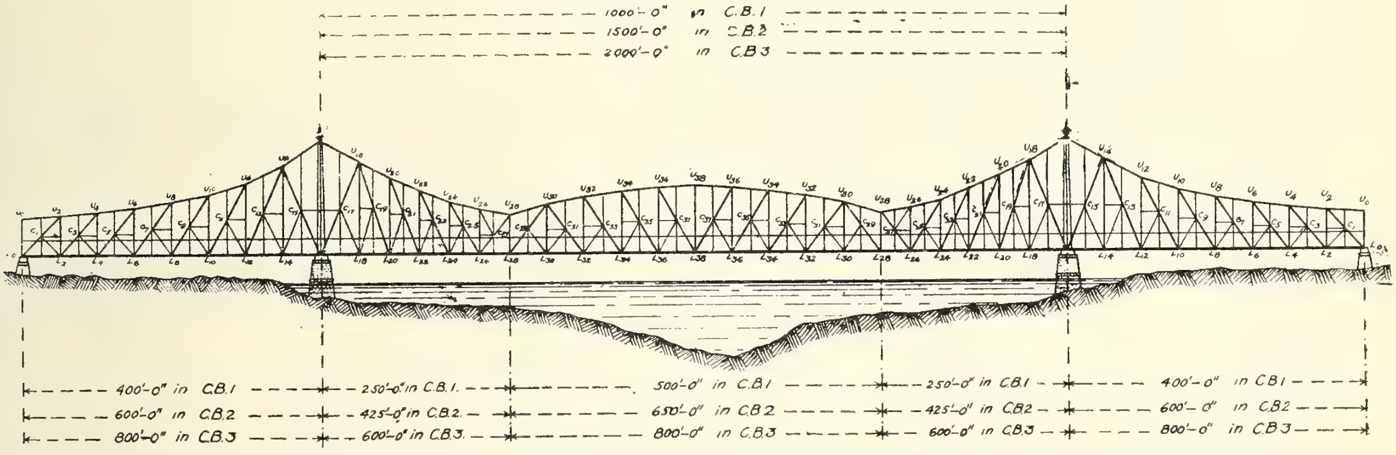
Let the weights (per linear foot) of live-load cable, suspenders, truss (including bracing) and floor be represented by L, C, S, T and F respectively. The weight of the cable is evidently proportional to the total load it sustains and to the length of span, provided the rise-ratio remains unchanged. The weight of the suspenders is likewise proportional to the load they carry and to the span, as a longer span requires a proportionally greater average length of suspenders. The weight of the truss may be considered in two parts; the larger portion provides for the live-load and is proportional to that load and to the span length, if the depth ratio remains constant; the other part of the truss-weight represents the contribution of the wind-stresses and will vary with the square of the span if the width of bridge remains constant. The weight of the floor system is evidently proportional to the assumed live-load, and is practically independent of the length of span. Introducing the empirical constants from the preceding designs in those relations, we obtain the following formulas for suspension bridges:

$$C = .068\ (C + L + S + T + F)\ l$$
$$S = .0075\ (L + S + T + F)\ l$$
$$T = .35\ L\ l + 105\ l^2$$
$$F = .84\ L$$

From these equations we find that the cable-section becomes infinite or C = infinity for a "limiting span" of

$$\text{Limiting } l = \frac{1}{.068} = 14{,}700 \text{ ft.}$$

This is the upper limit of feasible spans for suspension bridges and represents the span at which the suspension bridge would cease to be self-supporting.



Central elevation of cantilever bridges employed in comparative study of span length.

Maximum Span for Suspension Bridges

Although the above is the limiting feasible span, defined by C = infinity, it is evident that the sections will become too large for practical construction long before that length of span is reached. In order to determine the practical maximum span, a value for the maximum cable section must first be fixed.

The cables of the three largest suspension spans, viz., the Brooklyn, Williamsburg and Manhattan bridges, are 15⅝ ins., 18¾ ins. and 12½ ins. in diameter respectively. Cables with a diameter of 24 ins. were used in one of the designs in this investigation, but it is doubtful whether any larger diameter can be put together without excessive difficulty of manipulation and uncertainty of proper distribution of stress among the different strands. With the exception of some old chain bridges, there is no bridge on record with more than six cables. Twice that number, or four groups of three, were used in one of the writer's designs, but it is extremely improbable that a greater number than 16 could be practically combined in one structure.

Assuming, then, a section of 16 cables of 24 ins. diameter for the bridge of maximum span, we have

$$\text{Maximum } C = 20{,}000 \text{ lbs.}$$

Substituting in the preceding equations this maximum value of C, and assuming different values of the live-load (L), we obtain the following values for the maximum span:

$$\text{For } L = 10{,}000, \text{ max. } l = 4{,}900 \text{ ft.}$$
$$L = 15{,}000, \text{ max. } l = 4{,}000 \text{ ft.}$$
$$L = 20{,}000, \text{ max. } l = 3{,}500 \text{ ft.}$$

It is hardly probable that a structure of the magnitude under investigation would ever be planned for a lighter loading than about 10,000 lbs. per lineal foot, particularly when it is remembered that this would require about 10 lbs. of steel for every pound of useful load. It will therefore suffice to restrict the conditions of the problem to the practical limits of L = 10,000 to L = 20,000 lbs. of live-load per linear foot. We thus find that the maximum practicable span for suspension bridges ranges from 3,500 to 4,900 feet, depending upon the assumed live-load.

Economic Span for Suspension Bridges

The expression for the cost of any span (C) will be assumed of the general form.

$$C = al + bl^2 + cl^3 \ldots\ldots\ldots\ldots (1)$$

From the results of the preceding estimates we have

$$C = \$11{,}645{,}000 \text{ for } l = 1{,}500 \text{ ft.}$$

C = \$23,760,000 for l = 1,250 ft.
C = \$46,785,000 for l = 3,000 ft.

Substituting these values in (1), and solving the resulting three equations for the unknown coefficients, we obtain

$$C = 8{,}900\ l - 3.77\ l^2 + .0020\ l^3 \quad \ldots\ \ldots \quad (2)$$

as the general cost-formula for suspension bridges. This gives the combined cost of steelwork and substructures for any span for an assumed live-load of 18,000 lbs. per linear foot. For any other loading, the above coefficients should be changed in proportion.

Of the above cost, about 65 per cent. represents the steel work and all the remainder provides for the masonry and anchorages.

A study of the contracts for recent long-span bridges shows an additional cost of about 20 per cent. for pavements, tracks, railings, ornamental work, electrical lighting, etc. To this must be added the cost of terminal structures and real estate for the approaches. In a city structure the last item, as in the case of the Manhattan Bridge, may amount to more than the cost of the bridge itself; a fair average value would be about 100 per cent. Adding the above items, we find

Total first cost of bridge = 220 per cent. C.

The rate of interest will be assumed at 5 per cent. The annual cost of maintenance including repairs, painting, lighting, etc., averages about 4⅛ per cent. of the cost of the superstructure. In addition, a certain annuity must be set aside for periodic renewal. The foundations may be permanent, but the steelwork has a limited life. The life-periods of numerous suspension bridges, or the periods before reconstruction or removal, whether terminated by failure or increased traffic demands, have been compiled by the author and found to average 31 years. This value, or 30 years in round numbers, will be adopted as the probable life of the steelwork of a suspension bridge. At five per cent. compound interest a sinking fund to meet the cost of renewal in thirty years will require an annuity of 1.505 per cent. The annual charge against the bridge will therefore consist of the following items:

	% C
Interest charge = 5% × 220% C	11
Repairs and maintenance = 4.5% × 65% C.	3
Depreciation = annuity for renewal in 30 yrs. = 1.505% × 65% C	1
Total annual charge	15

The limiting economic span is that at which the revenue from traffic (T) just balances the annual cost of the structure. We may therefore write

$$15 \text{ per cent. } C = T \quad \ldots\ \ldots\ \ldots\ \ldots\ \ldots \quad (3)$$

as the defining condition for the economic span.

In the absence of any better guide, let us take the amount of travel on the Brooklyn Bridge as the maximum traffic to be expected on any other long-span structure. This value may justly be augmented by 50 per cent. for the greater capacity of a six-track bridge, but to compensate for the early years of undeveloped traffic this additional profit will be disregarded. We will therefore assume 118,000,000 passengers using the bridge in a year. For a span of the length under consideration, a toll of 5 cents per passenger would be an equitable rate. The same charge is now made for ferry or tunnel-transportation across the Hudson River, and bridge travel would surely be preferred for its greater speed and comfort..

At night, when the passenger traffic is a minimum, the tracks can be used for the transportation of freight. We may safely count on at least 1,500 cars of freight daily crossing a six-track bridge over the Hudson River or any similar location.

The total annual traffic over a long-span bridge may therefore attain the following value:

118,000,000 passengers at 5 cents	\$5,900,000
547,500 cars of freight at \$4	2,190,000
T = total annual revenue	\$8,090,000

Substituting this value in equ. (3) we obtain C = \$54,000,000 as the maximum justifiable expenditure for a long-span bridge. With this value of C, the solution of equ. (2) yields Economic l = 3,170 ft.

In the case of the proposed Hudson River bridge of somewhat shorter span, calculations indicated a profit of less than 1 per cent. on the investment, thus confirming the above result.

Conclusion

The limiting economic span for suspension bridges is about 3,170 ft., and will be less wherever the probable traffic returns are smaller than assumed in this investigation.

CANTILEVER BRIDGES

In adaptability to long-spans and possibility of erection without falsework, the cantilever is the sole competitor of the suspension bridge. Both of these types have attained prominence by remarkable examples of design and construction. The suspension type, however, with but one exception has never been employed for fast railway traffic. Its use has been confined to highway bridges or wherever aesthetic requirements prevailed. The banner bridges of the suspension type, those over the East River, have been attributed to "an ingrained fad of the New York Department of Bridges." For long railway spans the cantilever has almost invariably been given the preference on account of its superior rigidity at a given cost. The longest span in the world (Forth Bridge = 1,710 ft.) is of the cantilever form, and the Quebec Bridge, now under construction, will raise the record for length of span to 1,800 ft.

TABLE II.—PRINCIPAL DATA FOR DESIG. OF CANTILEVER BRIDGES.

	No. 1. Ft.	No. 2. Ft.	No. 3. Ft.
L = total span = m + l + m ...	1,000	1,500	2,000
l = suspended span	500	650	800
m = cantilever arm	250	425	600
n = anchor arm	400	600	800
w = width c. to c. of trusses	50	60	80
d = depth of suspended truss	50-85	75-110	110-135
h = depth at towers......	150	225	300

Load: L L = 18,000 lbs. per ft. Wind = 30 lbs. per sq. ft.

Working stresses:	Tension.	Compression.
Structural steel	20,000	$\dfrac{20{,}000}{1 + \dfrac{l^2}{8{,}000\ r^2}}$
Nickel steel	30,000	$\dfrac{30{,}000}{1 + \dfrac{l^2}{8{,}000\ r^2}}$

For erection of stresses. the above may be increased by 20%.

Before proceeding with the designs, the author made a special study of the problems of economic span ratios and width-ratios for cantilevers. The results are incorporated in Table II. In the estimates of cost, the same unit prices are used as in the case of the suspension bridges.

Estimate of cost

The result of the author's designs of the above cantilevers are summarized in Table III of costs.

Empiric Formulas for Weights of Cantilever Spans

Let T_1, T_2, T_3 = truss-weights per lineal foot in suspended span, l, cantilever arm, m, and anchor arm, n, respectively.

F = Weight of floor, per lineal foot.

L. L. = Live load per lineal foot.

We may then construct semi-empiric formulas for the truss-weights from the results of the preceding designs as follows:

Suspended Span.—The weight per lineal foot of a simple truss, if the relative dimensions are kept fairly constant, is proportional to the span and to the total load carried. Introducing a factor of proportionality, a, we have

$$T_1 = a\,(T_1 + F + \text{L. L.})\,l \;\ldots\ldots\ldots\ldots \quad (1)$$

Applying this equation to the preceding designs, we find

$a = .00056, \quad .00053 \quad .00053;$

or, as a mean value,

$a = .00054.$

Cantilever Arm.—A simple formula, involving but one undetermined coefficient, may be constructed from the observed fact that the weight per lineal foot of the cantilever arm varies with the total loading and with the square root of the channel span, or

$$T_2 = b_1\,(T_2 + F + \text{L. L.})\,\sqrt{L} \;\ldots\ldots\ldots \quad (3)$$

The constant of proportionality, b, is determined from the preceding designs, as

$b = .0133 \quad .0134 \quad .0134$

This close agreement between these values of b indicates the reliability of the above formula even under varying values of the suspended span ratio. Taking the mean value, we have

$b = .0134$

As the total amount of steel is not materially affected by limited changes in the form or proportion of the trusses, and as variations in the spans and in the loading are fully provided for in the above fomulas, they may properly be applied to any other cantilever bridges designed for any live-load, provided the same working stresses are used. Whenever improved material or construction justifies higher unit stresses, the empirical constants in the above formulas should be reduced in the inverse proportion.

Limiting Spans for Cantilevers

Limiting Channel Span.—A solution of the empiric formula for the weight T_2 of the cantilever arm, as established in the preceding article, yields

T_2 = Inf. for Lim. L = 5,600

Hence the limiting span for cantilever bridges is 5,600 ft. This value may be approached, but never exceeded, by increasing the ratio of dead-load to live-load indefinitely.

Note that the corresponding limiting span for the suspension bridge is 14,780 ft., or about 2.6 times as great as the above.

Maximum Practicable Span for Cantilevers

In the three cantilever designs executed above, viz.:

L = 1,000, 1,500, 2,000 ft.

the maximum required section is found in the lower chord of the anchor arm and amounts to

Max A = 574 1,302 2,338 sq. ins.

It will be observed that these cross-sections are almost exactly proportional to the squares of the respective channel spans. Considering also that the section must vary with the live-load for which the structure is designed, we may write the proportion

$$\text{Max. A} = k\,(\text{L. L.})\,L^2.$$

Substituting the values of Max. A, L. L. and L from the above designs, and solving for the unknown coefficient, we find

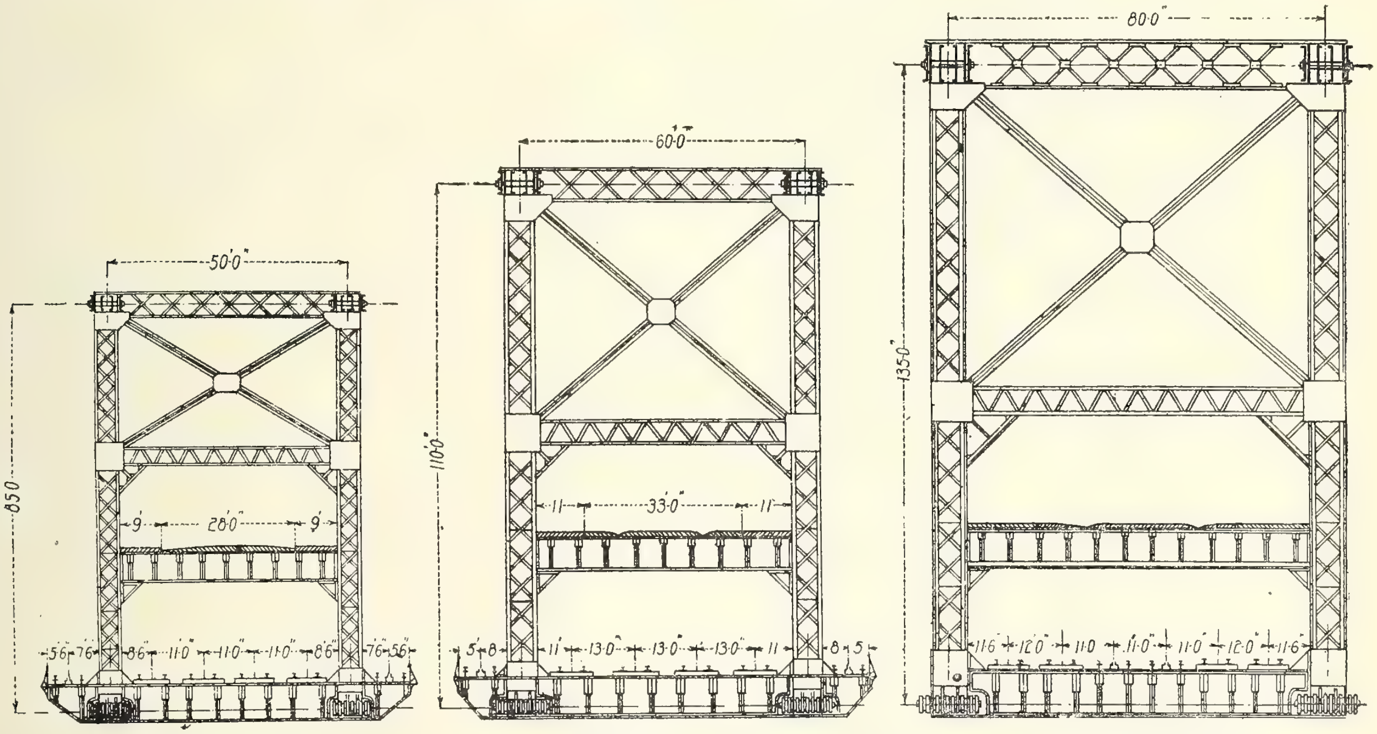
$k = .031 \quad .032 \quad .032$

so that the above formula becomes

$$\text{Max. A} = .032\,(\text{L. L.})\,L^2 \;\ldots\ldots\ldots\ldots \quad (1)$$

where L is supposed given in 1,000 ft. units.

Hence the maximum practicable span for a cantilever is given by



Cantilever Bridge No.1
Span = 1000 Ft

Cantilever Bridge No.2
Span = 1500 Ft.

Cantilever Bridge No 3
Span = 2000 Ft

Midspan cross section of three cantilever bridges being compared.

$$\text{Max. } L = \sqrt{\frac{31.2 \text{ Max. } A}{\text{L. L.}}} \ldots\ldots\ldots (2)$$

Where Max. A is the greatest practicable cross-section in square inches, and L. L. is the assumed live-load in pounds per lineal foot.

Largest Cross-Sections in Actual Use

The values of the largest cross-sections ever fabricated are the following:

	Sq. ins.
Queensboro	1,120
Quebec	843
Beaver	639
Kansas City (truss)	485
St. Louis (truss)	441
Monongahela	348
Thebes	317
Memphis	228

All of the above chord-sections are of the multiple rib type. The number of ribs composing the section never exceeded four, that being the number used in the Quebec, Queensboro, Thebes, and Memphis bridges. Any larger number of ribs would make the action of the whole member as a unit extremely problematic; and, in the light of recent experience, no conservative engineer would propose such a section.

TABLE III.

Cantilever bridge.	L = 1,000 ft.	L = 1,500 ft.	L = 2,000 ft.
Suspended span	$ 573,919	$ 1,030,039	$ 1,929,267
Cantilever arms	874,266	2,261,308	5,308,402
Anchor arms	1,274,040	2,757,066	5,782,610
Towers	705,456	2,047,680	4,669,056
Anchorage steel	78,500	179,410	337,430
*Total	$3,506,181	$ 8,275,503	$18,026,765
Main piers	876,164	1,261,720	2,153,040
Anchorages	524,160	1,032,480	1,944,000
†Total	$1,400,324	$ 2,294,200	$ 4,097,040
‡Total	4,906,505	$10,569,703	$22,123,805

*Steelwork. †Substructure. ‡Cost of bridge.

The greatest depth of rib is 5 ft. 6½ ins. occurring in the Beaver Bridge, followed by a depth of 4 ft. 6½ ins. in the Quebec and St. Louis bridges. In Lindenthal's design for the Hell Gate Arch (1,000-ft. span) a 10-ft. depth of rib is proposed. This is so far in advance of any previous design, and involves so difficult a problem of adequate stiffening and bracing, besides the difficulties of fabrication, that it may well be taken as the extreme limit for practicable depth of rib.

The greatest thickness of rib is 5¾ ins. in the Queensboro Bridge, followed by 4 7/16 ins., 4¼ ins. and 3½ ins. in the Monongahela, Hell Gate and Quebec bridges, respectively. On account of the extreme difficulty of riveting through so great a thickness, it is hardly probable that any greater thickness than the above, or say 6 ins. at the most, will ever be used.

Combining the above limitations, we find that the greatest practicable chord-section would consist of four ribs, 10 ft. deep and 6 ins. thick. Adding the largest angles obtainable for the flanges the total area will be, in round numbers,

$$\text{Max. } A = 3{,}000 \text{ sq. ins.}$$

With the necessary diaphragms and lacing, such a member would weigh over 7 tons per lineal foot.

This value of Max. A. is nearly three times the cross-section of the largest member ever fabricated (1,120 sq. ins. in the Queensboro Bridge) and over twice the largest section to be used in the Hell Gate Arch (1,437 sq. ins.). A member of 2,300 sq. ins. occurs in the plans for the Hudson River Bridge of 2,160 ft. span designed by the Union Bridge Company in 1893, and a slightly larger cross-section (2,338 sq. ins.) is found necessary in the author's design of a 2,000-ft. cantilever bridge. But the above sectional area of 3,000 sq. ins. is far in excess of any chord section ever proposed.

Value of L

Substituting Max. A = 3,000 in. equ. (2) above, we find the following values of the maximum span for the different assumed live-loads:

For L. L. = 10,000 lbs. p. l. f. Max. L = 3,060 ft.
For L. L. = 15,000 lbs. p. l. f. Max. L = 2,500 ft.
For L. L. = 20,000 lbs. p. l. f. Max. L = 2,160 ft.

As it could hardly be considered practical to design a cantilever bridge of the magnitude under the consideration for a smaller live-load than about 10,000 lbs. per lineal foot, we conclude that the maximum practicable span for the cantilever type ranges from about 2,000 to 3,000 ft., depending upon the assumed live-load.

Comparing these with the corresponding values established long-span construction becomes apparent.

Economic Span for Cantilevers

As in the case of suspension bridges, the expression for the cost of any span (L) will be assumed of the general form:

$$C = a.L + b.L^2 + c.L^3 \ldots\ldots\ldots (1)$$

From the results of the preceding estimates, we have

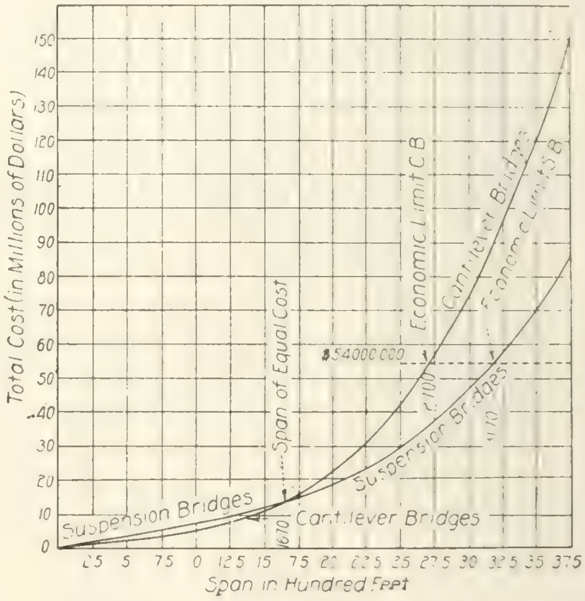
$C = \$\ 4{,}905{,}000$ for $L = 1{,}000$ ft.
$C = 10{,}570{,}000$ for $L = 1{,}500$ ft.
$C = 22{,}125{,}000$ for $L = 2{,}000$ ft.

Substituting these values in equ. (1), the unknown coefficients are determined, giving

$$C = 6{,}350\ L - 5.25\ L^2 + .0038\ L^3 \ldots\ldots (2)$$

as the general cost-formula for cantilever bridges. This gives the cost of steel work and substructure for an assumed live-load of 18,000 lbs. per lineal foot. For any other loading, the cost may be taken as varying in proportion.

Assuming the same cost of approaches, volume of traffic, life of steel work, expense of maintenance and rate of interest as for the suspension type, the limiting economic span for the cantilever will be defined by the same total cost as in the case of the suspension bridge, viz.:



Curves showing respective costs.

$$C = \$54{,}000{,}000$$

As previously shown, this is the greatest expenditure for a long-span bridge, exclusive of approaches and accessories, that is warranted by the maximum traffic returns to be reasonably expected. Substituting this value in equ. (2) and solving, we find

Econ. L = 2,700 ft.

as a maximum economic span for cantilevers.

Hence, the greatest span for which the cantilever type may be profitably employed is 2,700 ft. or less, depending upon the probable maximum traffic returns.

Span of Equal Cost

Plotting the costs for the three suspension spans designed above, a smooth curve passing through the three points and the origin constitutes a cost-graph for suspension bridges. In the same manner the graph representing the costs for different cantilever spans is constructed. The point where the two curves intersect marks the span of equal cost for the two types of construction, and is found at

l = 1,670 ft.

Below this span, the cantilever bridge is cheaper; above this span, the suspension bridge exhibits the greater economy. As this value lies within the range of spans actually designed for each bridge, i.e., between the known points on each graph, the error of the above method, involved in extending the results of individual designs to other spans, is negligible.

The analytical equivalent of the above process consists in comparing the cost-formulae for the two types of bridges. Equating the respective cost-expressions, and solving, we find, for the span of equal cost,

l = 1,670 ft.

exactly as before.

The above comparison is somewhat unfair to the suspension type, as the side-spans in the above designs were 0.51 in the suspension bridges and only 0.41 in the cantilevers. Assuming therefore, that steel viaduct approaches are added to the cantilever bridges to make up the difference in total length, and estimating the cost of such viaducts at $1,000 per lineal foot, the span of equal cost is reduced to

l = 1,626 ft.

somewhat less than the value established above. If the comparison of costs had been made between bridges of equal channel span, the result would have been still more favorable to the suspension bridge, reducing the critical span to about

l = 1,500 ft.

Neglecting these differences in favor of the suspension type, we conclude that l = 1,670 ft. is the extreme upper limit of spans at which the cantilever can compete with the suspension bridge, when economy is the sole criterion.

Conclusions

In the foregoing designs, special care was taken to proportion the depths of truss in both types for equal and ample rigidity, so that the single inherent advantage claimed for cantilevers, viz.: greater stiffness for railway traffic, is eliminated from consideration. Consequently no advantage remains to the cantilever type above the limiting span of 1,670 ft. The suspension bridge, on the other hand, is universally admitted to possess greater aesthetic qualifications; and for a long-span city structure, this is a factor of decisive importance. For this reason alone, the above value for the span of equal cost should be considerably reduced, in favor of the suspension type, to obtain the " span of equal merit."

The preceding investigations have been restricted to designs for heavy railway traffic. For highway bridges, a relatively lighter stiffening truss may be used in the suspension type, thereby causing a considerable reduction in the span of equal cost.

Confining our attention to economic considerations, our final conclusions may be stated as follows:

(1) The range of economic usefulness for cantilevers extends from the upper limit for the truss or arch to a span of 1,670 feet. Beyond this value, the cantilever would be more costly than the suspension type, although yielding a probable profit on the investment up to a span of 2,700 feet.

(2) The range of economic usefulness for suspension bridges begins at 1,670 ft. (or less in the case of highway bridges) and extends to the upper economic limit of 3,170 ft. Above this limit, the construction of suspension bridges would be practically feasible, but not as a profitable investment, up to an extreme limit of 4,000 feet.

Specifications for Concrete Road Work*

IN view of the increased interest now manifested on all sides in the question of good roads we are publishing the specifications for concrete road building as issued by the Illinois Highway Commission. The specifications are comprehensive and should ensure permanency.

Concrete Materials

Cement—Some standard brand of Portland cement shall be used which has been in practical use on public works and shall have proved satisfactory therein. No brand of cement shall be used which the engineer deems unfit for the work, nor shall any cement be used which fails to give satisfactory results according to the standard methods of testing as provided by the American Society for Testing Materials. The contractor shall provide sufficient means to protect the cement against dampness, and no cement shall be used which has become caked.

The contractor shall notify the engineer in writing what brand or brands he intends to use, and before ordering the cement shall receive the written approval of the engineer as to the brand selected. It is understood that such approval merely covers the selection of the brand; that the cement itself may be rejected if it fails to meet the requirements herein specified.

Coarse Aggregate—The coarse aggregate shall consist of clean, hard, sound flint or other hard siliceous pebbles, having a reasonably uniform graduation from a size which will pass through a 1-in. screen to a size that is retained on a ⅛-in. screen, and no gravel composed in part of slate, shale, disintegrated limestone, or other equally soft stone, can be used. Crushed granite or trap rock, graded to the size provided above, may be used. Crushed lime stone, graded to the size specified above, may be used only upon the approval of the engineer.

Fine Aggregate—The fine aggregate shall consist of clean, sharp quartz grains, and shall not contain over 2 per cent. of clay or loam. The fine aggregate shall be reasonably uniformly graded from a size which will pass through a ⅛-in. screen down. Sand containing disintegrated shale, slate or limestone shall not be used.

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*Concrete Age

Grading of Aggregate

The specification that the coarse of fine aggregates must be reasonably well graded shall be interpreted to mean that the percentages of the aggregates passing screens of various sizes shall be within the limits given in the following tables:

Table of Graduation of Coarse Aggregate

Size or screen	Allowable limits of percentage passing through
1-in. square mesh	100
¼-in. square mesh	Not less than 45 nor more than 60

Table of Graduation of Fine Aggregate

Size or screen	Allowable limits of percentage passing through
⅛-in. sq. mesh	100
1/16-in. sq. mesh	Not less than 65 nor more than 85

If the contractor desires to use aggregate which is not graded in accordance with the table, he must submit a sample of 50 lbs. of such material to the Illinois Highway Commission, Springfield, Ill., one week prior to the date of the letting of this contract. His sample of aggregate will be analyzed and, if found suitable, its use will be approved in writing and the amount of cement that must be used with the sample submitted, its use will be approved in writing and the amount of cement that must be used with such aggregate will be stated. The aggregate used in the construction work must then be graded in accordance with the sample submitted, and must be of the same kind and quality as the sample, and the amount of cement used must be the quantity required by the engineer in accordance with this paragraph instead of the amount provided in paragraph 32. (Proportions for concrete.)

Use of Gravel

The use of gravel made up of a mixture of the coarse and fine aggregates described above will not be permitted. If the contractor wishes to use such material, he must screen it to the sizes specified above before proportioning the aggregate for mixing.

Concrete Mixer

The concrete mixer used on the work provided for herein shall be a batch mixer of a type approved by the engineer. The concrete shall receive at least four complete turns of the drum before being discharged and if in the opinion of the inspector, a greater amount of mixing is required, this number of turns shall be increased until a thoroughly mixed concrete is secured.

Proportions for Concrete

The concrete for the work provided for herein shall consist of 1 part of cement, 2 parts of fine aggregate, and 3½ parts of coarse aggregate. The aggregate shall be placed in the mixer in such manner as to insure that a uniform amount of each class of aggregate is used in each batch of concrete; and the method of measuring the aggregate, whether in wheelbarrows or otherwise, shall be approved by the inspector, 1 sack of cement to be considered as 0.95 cu. ft., and all measurements to be by volume.

Water

The water used in mixing the concrete shall be clean.

Size and Kind of Roller

Wherever it is provided herein that rolling shall be done on the road bed or macadam shoulders, a three-wheel self-propelling roller, weighing not less than ten nor more than twelve tons shall be used.

Road Bed

The road bed will be considered as that portion of the road upon which the concrete roadway and macadam shoulder are placed. The road bed shall consist of the natural earth which has been brought to the proper elevation and cross-section and rolled until firm and hard. If sandy or other soil is encountered which will not compact readily under the roller, a small amount of clay or loam shall be added so as to secure a firm, hard surface after rolling. The road bed shall be thoroughly saturated with water immediately before concrete is placed.

Shoulders and Side Roads

After the completion of the concrete roadway and macadam shoulders, the side roads are to be shaped in accordance with the cross-section shown on the plans and shall be rolled, care being taken not to allow the roller on the edge of the concrete roadway. Upon completion, the cross slope of the concrete roadway, macadam shoulders, earth side roads and ditches shall be as shown on the plans.

Thickness of Concrete Roadway

The concrete roadway shall have, after completion, the thickness shown on the plans. If a greater thickness is said than that shown on the plans, no extra compensation will be made therefore.

Under Drains

An under drain 8 ins. wide and 6 ins. deep shall be constructed under each of the concrete roadway edges, the entire width of the drain being under the pavement. This under drain shall be filled with broken stone or coarse aggregate before the concrete is placed. At the end of each expansion joint or at intervals of not to exceed 50 ft., blind cross drains, not less than 8 in. wide, shall be constructed from the longitudinal drains before mentioned, to the gutter. These cross drains shall be of such a depth as to drain readily from the longitudinal drains to the gutter, and shall be filled with at least 6 in. of crushed stone or coarse aggregate, and then covered with earth, except that such part of the cross drain as lies under the macadam shoulder shall be filled with stone when the shoulder is constructed. The longitudinal and cross drains shall be completed before the concrete roadway is constructed.

Side Forms

The concrete roadway shall be placed between side forms of 2-in. plank. The side form plank shall be of a width equal to the thickness of the pavement at the edge. The side form planking shall be accurately set to the alignment and grade of the pavement, and shall be held securely in place by adequate stakes and bracing. Intermediate longitudinal form boards will not be permitted between the side forms to support the templet.

Placing Concrete Roadway

The concrete for the roadway shall be placed between the plank forms before described, the entire thickness of the concrete being placed at one time. After the concrete has been deposited between the forms, it shall be raked and tamped until the mortar flushes to the top, and the concrete shall be placed in such quantity that there will be a slight excess between the forms. The surface of the roadway shall then be shaped to conform to that which is shown on the plans by striking off with a templet cut to the proper shape. This templet shall be drawn along the forms, and shall be held securely against the top of the forms, and shall be moved with a combined longitudinal and crosswise motion which will prevent dragging the larger particles of the aggregate and marring the surface.

Finishing Surface of Concrete Roadway

After the surface of the concrete roadway has been stuck off to the proper cross-section, it shall be finished with wood floats. The wood floats shall be used only to flush mortar to the porous places in the surface, and great care must be taken not to rub hollow places in the surface. The wood float finish shall be made as soon after the concrete has been deposited as possible, and in no case shall the finishing be delayed until the concrete has taken a set.

Covering Concrete Roadway

After the concrete roadway has been finished as above described, the roadway shall be covered with suitable canvas as soon as this can be done without marring the surface, which shall be kept wet, and as soon as the concrete sets sufficiently, the canvas shall be removed and the concrete covered with earth. The earth covering shall be put on at least 1-in. thick and shall be kept constantly wet for two weeks. The roadway shall be kept closed to traffic for two weeks, or, if in the opinion of the engineer, the weather conditions make it advisable, the roadway shall be kept closed to traffic a longer period of time.

Expansion Joints

Expansion joint shall be provided and spaced as shown on the plans. The expension joints shall be set at an angle of 60 degrees with the center line of the roadway and shall be of the type shown on the plans. The expansion joints shall be constructed in such manner as to insure that the metal plates, creosoted blocks, or other device provided for the joints, shall conform to the cross-section provided for the roadway, and great care must be exercised in placing these joints to insure that there will be neither a depression nor a raised place at the joint.

Cleaning Finished Pavement

When the concrete roadway has been completed for a sufficient length of time to permit a proper setting of the concrete, it shall be cleaned and then opened to traffic.

Beveling Edges

If the plans shall provide that the edge of the concrete shall be levelled, then the plank forms shall be removed from the edge of the roadway before the concrete takes its final set, and the edge of the pavement shall be cut off by means of a shovel or other suitable tool so as to give the shape shown on the plans.

Macadam Shoulders

The macadam shoulders when completed shall be of the width and thickness shown on the plans. The stone for the macadam shoulders shall be deposited, spread and rolled at least twice over, and then covered with screenings or gravel, sprinkled and rolled. When completed the macadam shoulder shall be true to shape and shall be one-half inch above the concrete where it joins the concrete roadway.

Trimming Sides of Road

The slopes on cuts and fills shall be neatly trimmed to the slopes shown on the plans, and all detritus and surplus materials left after completion of the work shall be removed from the road.

New Terminal Railway

THE contract for the construction of the Halifax Terminal Railways, which was let in Ottawa recently, is the first step in the development of the harbor terminal scheme announced for that port some nine years ago.

Five miles of railway are to be built through the heart of the Halifax residential district to the city's southern water front, where a series of piers are to be constructed.

The scheme involves the eventual construction of berths for thirty ocean steamers and is to cost thirty-five million dollars, but this expenditure is to be spread over a considerable period of years.

The work to be carried out first includes the construction of the terminal railway, two piers and a union passenger station in the south end of the city. The project involves a complete revolution in the civic life of Halifax as much of what is now the best residential portion of the city will be utilized for railway purposes and this displacement of population has given rise to an era of real estate speculation.

Serious Forest Fires

NORTHERN Ontario has been visited once more by devastating bush fires. The fires covered a district two hundred and fifty miles wide and extending from a little north of Cobalt as far as Cochrane. The losses will reach into the millions and includes settlers' effects and homes, crops, standing timber, transmission lines, power houses and mining plants. So far no loss of life has been reported. The dry weather of May and June is given as the cause.

The passing of the special Irish Acts for the better housing of the agricultural labourer has been amply justified by results and we see no valid reason why the introduction of similar measures for England should not be attended with success. Not only is there a shortage of cottages in this country but a large number of those in existence are in a deplorable condition and ought to be demolished. The same remark applies with equal force to quite a number of our large towns. Many areas are unfit for habitation and stand urgently in need of condemnation but the authorities have to content themselves by wiping out single houses here and there, for the reason that other accommodation cannot be found for the families displaced. Overcrowding is very common, but while unemployment and high rents co-exist, all the by-laws and inspectors in the world cannot suppress this evil. A writer recently quoted a case where a widow, six sons, two daughters, the widow's mother and a male lodger—eleven souls in all—herded together in one living room and a divided attic. Physically, morally and mentally, what standard could be expected of the denizens of such a "Black Hole"? Well may it be asked if civilization is a failure when cases like this are brought to the light of day.—Slate Trade Gazette.

Wireless service between Norway and America will probably be provided shortly by the Marconi company, following the recent approval by a committee of the Norwegian Parliament of a contract under which the Norwegian Government is to spend $560,000 in the erection of a station at Stavanger which is to communicate with a station at Boston.

Building Operations in Calgary

Report on Power Question—Department of Natural Resources—Tenders for Cold Storage Building—New Factory

Correspondence of the Contract Record

THE fine weather of the past month has permitted great progress in the construction of all classes of buildings. Several large contracts have been let recently, and all architects seem to be busy. The contract for the new police station has been let to Thomas, Jameson & Mackenzie, of Calgary, for the sum of $103,520, exclusive of plumbing and heating, electric wiring, elevators, and the steel police cells. The building will be of the steel cage type, five storeys in height, with reinforced concrete floors, red pressed brick exterior, and cut stone trimmings. The architects are Lang & Major, of Calgary. The city of Calgary has let the contract for a power sub-station in North Calgary to Bennett & Debman Company, for the sum of $21,000 complete without transformer equipment

Power Question

Rapid progress is being made on an addition to the present municipal power house. During the early winter R. A. Ross & Company, of Montreal, were called upon to investigate the power situation in Calgary. They report to the effect that unless the Calgary Power Company, Limited, which has a large hydro-electric plant forty miles west of the city can guarantee service, that the city council should not enter into contract with them for the full amount of power required. The engineers estimate the present power demands of the city to be about 10,000 h.p. The Calgary Power Company has now under contract nearly 10,000 h.p., with no allowance for breakdowns, although they have under construction a new power station which will enable them to take care of local requirements by next year. Until this new installation is completed, they will be unable to guarantee the service the city of Calgary desires. Under the circumstances, arrangements have been made to add a power unit of 5,000 kw. to the existing power facilities, with provision for further additions as required. To this end the power house will be enlarged by an addition 118 feet in length, running the full width of 130 feet of the present structure. The municipal authorities have commenced excavations, and will place the concrete for the foundation walls and settings. A separate contract will then be entered into for the construction of the brick walls. The contract for the steel superstructure has been let to Phillips, Lang Company, of Chicago, for the sum of $22,425. This includes the erection of the 260 tons supplied. There will be seven roof trusses over the engine room with a span of 50 feet, the type being a modified Warren truss, carrying a skylight monitor. A double row of columns running the length of the boiler room will carry seven roof trusses and plate girders, on spans of 23 feet, the latter having to carry the coal hoppers for the automatic stokers. These roof trusses will carry a skylight monitor also, together with the coal handling conveyors. On either side, in the bays between these columns and the outside walls, will be fourteen additional roof trusses with spans of 28 ft. 6 in. All trusses are in general fabrication from 2½-in. x 2½-in. x ¼-in. angles. The roof will be wooden, built of 2-in. x 4-in. joists laid with shiplap boards to the weather. The first installation will consist of one 7,000 h.p. Allis-Chalmers steam turbine direct connected to one 5,000 kw. generator. The work is in charge of Mr. J. F. McCall, Chief Engineer for the city of Calgary.

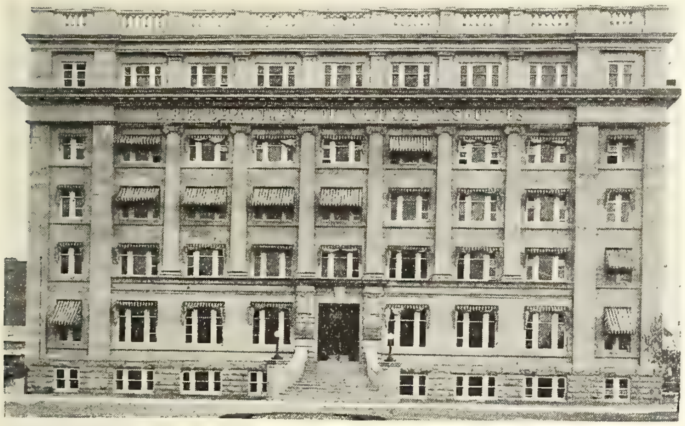
C. P. R. Buildings

The Canadian Pacific Railway has about completed the larger portion of the improvements undertaken in this city, including the $1,500,000 hotel, the station and the offices of the Department of Natural Resources, the car shops in East Calgary, and the replacing of many bridges. Not the least of these has been the construction of the railway station, commenced two years ago and completed recently. So rapid has been the growth of the city that the company has been forced to begin additions to this building as fast as other portions were completed. It is made of reinforced concrete, with sandstone exterior, and has cost altogether about $325,000. Besides the necessary offices for the local and divisional point, the building accommodates the Dominion Express Company and the Telegraph Company. J. McDiarmid & Company, Ltd., of Winnipeg, were the contractors for the entire building. East of the station building, and at right angles thereto, stands the office building housing the C. P. R. Department of Natural Resources, which includes the forces in charge of the immense irrigation projects of the company. The building was commenced two years ago, and five storeys were completed, but it was found necessary to add another storey during the past winter and to install an elevator. This also is of reinforced concrete, the Kahn system being used, and is finished with limestone. The architects were Hodgson, Bates & Beattie, of Calgary, and the contractor for the original structure was the J. McDiarmid & Company, Limited, of Winnipeg. The railroad is now engaged in the process of completely interlocking all trackage facilities east of the station, including the car shops. There is a total of nearly eighty miles of track in the terminal district, this city being the junction of the Calgary and Edmonton Railway. The system will be operated by electricity.

Large Cold Storage Plant

L. R. Burn, of Calgary, has been awarded the general contract for the construction of the new $300,000 cold storage meat curing building for P. Burns & Company, Limited. The new building will replace the plant destroyed by fire during January last, and will be complete in all its details, and of fireproof construction. The plant will be served by the present boiler and engine house. The owners are to install piping and refrigeration machinery, and insulation is to be carefully looked after. The building will be 198 feet long by 125 feet deep and will be six storeys high, including the basement, or 60 ft. 6 in. high from basement floor to top of roof slab. The exterior will be of common pressed brick, the walls running the full height of the building entirely independent of the internal structure. There will be reinforced concrete columns inside these walls to carry all floor loads, so that the seventeen inch wall will be free from any but its own dead weight. On the east end of the building, adjoining the existing plant, there will be a team loading concourse, protected from the weather by a steel canopy 24 feet wide suspended from the face of the building, so that all columns will be eliminated. The main line of the Canadian Pacific Railway runs close to the north side of the plant, two sidings, inside a steel and concrete shed running the entire length of the building will be built. Overhead tracks from the shipping floor of the new plant will be used for loading the export cars.

The superstructure will be a flat slab system of reinforced concrete. This consists of a flat floor plate supported on the flaring column head by a square plate. The column spacing is seven bays of 17 ft. and thirteen bays of 17 ft. 6 in., and the one-half inch round steel for reinforcing is run in narrow bands of from twelve to sixteen rods in eight directions. The steel is supported at the column head by one ¾-in. round rod bent to a 5-foot square, and entirely within the floor slab. The steel from the column does not flare out as in most of such systems, the required support for the slab being gained by the 6-foot square plate of concrete on the column head, without the use of steel. The footings for the interior columns are all square, reinforced, involving nothing unique in the construction. The exterior columns and the enclosing walls are independent, the wall resting on a 17-inch concrete construction the height of the basement, and the columns carried on a reinforced concrete beam 37 inches wide and 36 inches deep, running the length of the walls, and monolithic at the ground with the concrete wall, which in turn is reinforced. The foundations will be in a very closely compacted gravel allowing of very high bearing stresses. The floor slabs in general are 8 inches and 7½ inches thick, except a portion of the loft floor, which is a combination terra cotta block and concrete floor 9 in. thick, the openings in this floor for the loft precluding the use of the flat slab system. The roof slab will be 6½ in. thick, and will be thoroughly insulated in the following manner: —over the roof slab there will be placed two layers of 2 in. cork board, then 2 in. of impregnated cork, next 2 plies of roofing felt. The cinder fill necessary to give the roof the proper pitch will be placed on top of this, followed by 2 inches of cinder concrete, over which will be laid the 5-ply tar and gravel roofing for the weather. The millwork throughout the building will be of white pine. Brill & Gardener, of Chicago, are the architects and engineers; Mr. F. G. Carpenter is the designing engineer for the owners.



Department of Natural Resources.

Plate Glass Plant

Hodgson, Bates & Beattie, architects, Calgary, have prepared plans for a large warehouse for Pilkington Bros., Ltd., the largest plate glass manufacturers in the world. The building will face 100 feet along 10th ave. east, and will be 117 feet deep, abutting on a siding of the C. P. R. A feature of the design will be the shipping and receiving floor, 42 feet wide and running the depth of the building, with a clear height of 35 feet to the bottom of the steel roof trusses. There will be seven of these trusses, of the deck Pratt type, weighing 209 tons, and they will support the reinforced concrete roof with skylight monitor, and will also carry, suspended below, one rail for a 2-ton crane. This crane will have a runway of 80 feet, with an 18-foot span, and will be used for unloading the plate glass from the cars, the crane covering the siding track in its runway. There will be a second crane spanning the floor which will have a capacity of one ton and will be used for transferring about the floor and for loading drays. This crane will have a 40-foot span, with a runway of 117 feet and will have pneumatic apparatus for dealing with polished plate glass. The remaining area of the warehouse will be covered by a structure four storeys high. The exterior will be of local pressed brick, with sandstone trimmings; the superstructure will be entirely of reinforced concrete except for the trusses and purlins over the shipping floor, as noted. The live loads used are very high, amounting to 500 pounds per square foot on the ground floor, reduced to 300 pounds per square foot on the upper floor. The roof will be of concrete with 5-ply tar and gravel covering. There will be a mezzanine floor for the local and shipping offices of the owners. The trim for these offices will be birch, all other trim to be B. C. fir; all windows are to be of rolled steel section; Corbin hardware is specified. There will be two elevators, one 7 ft. by 12 ft. and one 6 ft. by 12 ft. 6 in., the proportions being necessary for the commodity to be handled. The contract will be let shortly.

Building Material Prices in Calgary

The month of July opens with building material quoted as follows:—

Brick (enamel)	$14.00
Brick (pressed)	22.00
Hard wall plaster, per ton (sacks extra)	19.00
Hair (plaster), per bale	1.35
Keenes cement, per bag	2.50
Lime, per bushel	.40
Metal lath, per square foot	.22
No. 1 pine lath, per thousand	5.50
Wire nails, per keg	4.50
Plaster, per ton	22.00
Plaster paris, per barrel	4.50
Plaster board, per hundred square feet	22.00
Plaster bead, per foot	.07
Sand, coarse, per cu. yd.	1.75
Wood fibre plaster, per ton	19.00
Building paper, per roll	.90
Brick (kiln run)	9.50
Fire brick	$55.00 to 70.00
Fire clay, per ton	30.00
Flue lining	.40
Gravel, per yard	1.75
Hollow brick (per thousand)	13.00
Tar paper	1.00
Roofing felt, per thousand	1.60
B. C. shingles, No. 1, per thousand	4.50
B. C. shingles, No. 2, per thousand	4.15
Sewer pipe	.27½

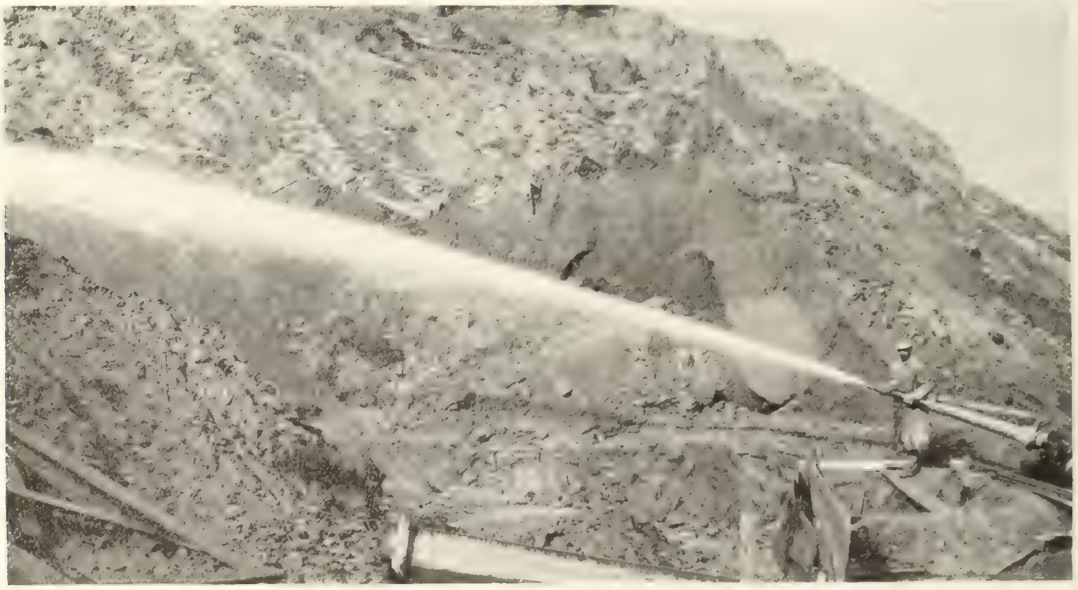
Terra cotta, 4 in.	.10
Terra cotta, 3 in.	.09
Terra cotta, 6-in.	.12
Terra cotta, 8-in.	.14
Metal wall ties, per thousand	6.00
Gasoline in barrels, per gallon	.33

The only disturbing element is the uncertainty concerning the labor outlook. The plumbers of Calgary are on strike and unless the Builders' Exchange agrees to give the bricklayers 75c per hour it is likely that they will lay down their tools on July first. It is to be hoped that some agreement will be reached as strikes at this juncture would prove a serious drawback.

Preparations for Building by Means of Hydraulics

By W. W. Hay, B.Sc.

WHAT is believed to be the largest private property development in the Dominion of Canada is now under way in Calgary. F. C. Lowes & Company, Limited, of Calgary, owners of many large properties throughout Western Canada, and particularly in Calgary, are the owners of Roxborough Place, a sub-division comprising about forty acres situated on the south bank of the Elbow River and surrounded on all other sides by high ground rising abruptly from the flats. The high ground immediately west of this sub-division is the property of the same company, and they have been grading and terracing the flats by sluicing the earth from the upper levels by means of hydraulicking. The work has many points of interest, both in the amount of material moved and the low costs.



Showing pressure of stream against bank.

The surrounding high lands lie from eighty to one hundred feet above the plain, and the earth has been sluiced down from that height and distributed to points as far distant as 3,000 feet, filling and grading the property for streets and for buildings. The operations were carried on during five months of last year, during which time it is estimated that fully 400,000 cubic yards of material were moved and it is expected that an equal amount will be moved during the coming season. During the first year the water was pumped direct from the city water mains, but the pressure was so lowered for the residents on the upper levels that at the beginning of the present year's work the owners installed their own pump at the river's edge, 2,500 feet distant from the operations. A temporary submerged weir diverts the water towards a 2-stage "American" centrifugal pump operated by a 50 h.p., direct current, Westinghouse motor, forcing the water to a second pump, 25 feet above the river, and nearly a half-mile distant. This second pump is the same as the first, though driven by a 100 h.p., direct current, Westinghouse motor, and delivers the water to the hydraulic giant nozzle 300 feet distant and 40 feet higher at the rate of 750 gallons per minute with a pressure of 102 pounds per square inch. Six-inch, extra heavy, cast iron pipe, with bolted flanged connections is used between the force pump and the nozzle, about 800 feet being used in all. The hydraulic monitor has a nozzle opening 1½ inches in diameter and is connected to the piping with a ball and socket joint.

The material excavated consists mainly of a sandy clay loam and the "giant" is capable of sluicing out from 150 to 400 cubic yards per 24-hour day, depending upon the amount of clay encountered. At one stage in the first operations a bed of blue clay was encountered which it was found impossible to sluice, necessitating its removal by teams. At another point a deposit of very excellent coarse sand was uncovered and the operations were diverted to allow the sand to be marketed. During the five months the operations were under way last year, upwards of 20,000 yards of this sand was sold and it is expected that the sales from the bank of sand will eventually offset all charges for the project. This sand lies 60 feet below the original ground surface and is at present exposed to a depth of from 15 to 30 feet, is at least 300 feet in length, and has not yet run out in the direction of the cutting. The better portions of the deposit consist of a good clean, sharp quartz sand, considered the best sand on the local market.

At the present date the operations are being confined to the building of two terraces, one 40 feet wide for a roadway, the other 160 feet wide for lots. These terraces run the entire length of the hillside and below the 100-ft. boulevard which runs up to the higher ground along the rear of the property. The earth is sluiced down beneath this road and across to the property, and is stopped at the edge of the required terrace by temporary bulkheads. A trench 2 feet wide and 20 inches deep is first dug on the proper alignment and 4 x 4 in. posts are driven at 6 ft. intervals. Shiplap boarding is then nailed on the inside of these posts and the whole filled with earth to form the bulkheads. The surplus water after depositing the major portion of the earth in suspension, drains off into the Elbow River, a distance of nearly 2,000 feet. When the grading was first commenced, a light timber flume 1,600 feet in length was used to carry the materials to the remote points of the property.

Showing two stage centrifugal pump attached to water main.

The operations have been carried on night and day, weather permitting, requiring a force of from ten to twelve men per shift, though at times there have been as many as forty men employed on the project. The hydraulic sluicing has covered to date an area of about 12 acres. Where particularly dense and compacted soil has been encountered, dynamite has been used to advantage to break the material into lumps small enough to be moved by the stream of water. The cost of moving 400,000 cubic yards of material during five months of 1912 is reported to have been but 6½ cents per cubic yard and it is expected to reduce this cost to 4½ cents per cubic yard during the remaining operations.

A Grouting Process for Preventing Slides on the Panama Canal

In the Culebra Cut on the Panama Canal serious difficulties are being experienced from slides, and the Isthmian Canal Commission's report for 1912 contains an interesting description of the geological formation and the cause of slides, by the geologist, Mr. McDonald.

The writer has reached the conclusion that the slides may continue to be a serious matter. Therefore it will be advisable to give consideration to any methods which will tend to prevent slides. A process used in shaft sinking and tunnel work suggests a method of erecting an underground retaining wall which (though not feasible for ground actually moving) will perhaps prevent the formation of a slide by taking care of the unbalanced pressures due to deep excavation.

Cementation Process for Sinking Shafts

While the method of filling cavities and rock crevices behind tunnel lining with cement grout has long been employed, a special application called the cementation process has been highly developed in France for sinking through porous and creviced water-bearing strata. Briefly, it consists of drilling a series of holes surrounding the shaft location through the porous strata to the more or less impervious coal measures, and pumping in cement grout under high pressure. The pumping may be either continuous, as the drilling proceeds, or (as in later undertakings was found to be better) in stages at intervals alternating with drilling every 16 feet. By this method a cylinder of cemented material is constructed within which the shaft can be sunk. In the earlier undertakings four drill holes were used, but for later shaft sinkings six holes were employed in a circle of 24 ft. diameter.

To prevent leakage to the surface of the injected grouting, a pit is first dug for each bore-hole through the loose earth and concrete placed tightly about a 12-in. standpipe, the top of which is capped. The cap has a stuffing-box, through which passes a grouting pipe that can be pushed to near the bottom of the hole. The pipe is connected with the pump, and the latter with the cement mixer. Before injection of cement begins, clear water is pumped through.

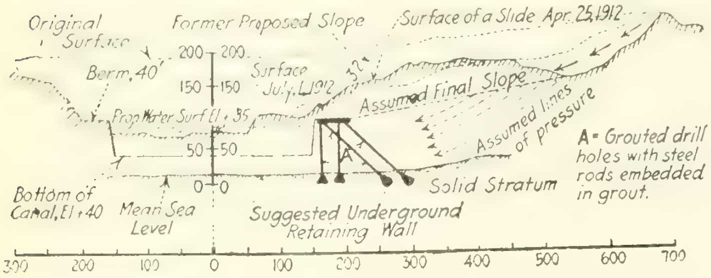
It has been found necessary to use only the finest ground cement, and employ pressures as high as 750 lb. per sq. in. to insure the thorough permeation of the cement into the small crevices and bedding planes of the strata. The cleaning out of all mud coating on the bore-hole is also found necessary. To this end it is the practice to drill the hole below the stand-pipe, about 7 in. diameter, and then ream to 10 in.

The water-bearing strata consist of marls or fissured chalks which are sometimes argillaceous. They are soft enough to be bored with an auger drill turned by power. The process has been so successful that it is supplanting the freezing system for sinking through highly water bearing strata in northern France and Belgium.

Constructing Underground Retaining Walls

The success achieved with the above process appears to offer possibilities in solidifying the slopes of unstable strata, at least sufficiently to prevent movement from occurring. The holes filled with concrete,

A further development was to "spring" the holes at the bottom by shooting with dynamite. This would open up crevices, permitting a more extensive cementation, and would provide an enlargement which would furnish anchorage for the tie bars. The upper end of the tie bar is to be held by a concrete capping. Thus the combination of vertical concrete posts and inclined metal ties (going deep enough to reach solid strata), with the ground cemented between, would furnish a triangular dam, or retaining wall, which should have great strength against lateral pressure.


Original Surface
Former Proposed Slope
Surface of a Slide Apr. 25, 1912
Berm, 40'
200
200
150
150
Surface July 1, 1912
32°
Assumed Final Slope
Prop. Water Surf. El. + 35
Assumed lines of pressure
A = Grouted drill holes with steel rods embedded in grout.
50
50
A
0
0
Solid Stratum
Bottom of Canal, El. + 40
Mean Sea Level
Suggested Underground Retaining Wall
300
200
100
0
100
200
300
400
500
600
700

The nearer the holes, the more thorough would be the cementation. The only limit would be that of cost. The system, if applied extensively, would be costly. But it would only be considered where the cost of repairing damage to an engineering work by an extensive landslide would be vastly greater.

In proposing the scheme for checking, or rather preventing, slides, the writer has had three main thoughts in mind: 1, as far as possible there should be drainage; 2, there should be a subdivision of the slopes from which the slides are liable to come; 3, there should be formed an underground dam, to prevent the foot of a slope from moving, and also to keep the water of the canal from circulating through the material. It is very much more destructive to the somewhat soluble walls to have water constantly entering and leaving the crevices through wave action, than if the ground water is merely held quiescent.

The scheme is as follows, and is shown by the accompanying cut:

1. To drill a series of holes along lines parallel with the axis of the canal, these holes to be both vertical and inclined, and go deep enough to reach firm strata below the level of the bottom of the canal. The depth of the holes might need to be 100 feet or over 150 feet.
2. Cement grout to be forced into these holes under pressure of 750 to 1000 lbs. per sq. in., so that the cement will penetrate all the fissures, making the mass impervious to water, and also binding the rock together.
3. Steel rods, 3 in. diameter or more, to be grouted into the holes.
4. Before the steel bars have been placed, dynamite is to be fired in the bottom of each hole to make an enlarged space in the firm stratum which the holes should reach. These will provide anchorage at the bottom. The rods will thus act as reinforcements to the cemented zone; and the rods in the inclined holes will serve as tension members of the wall. The latter rods will therefore be made much heavier than the others. The rods are to have nuts and washers or to be upset at each end. The upper ends are to be fastened in a concrete capping over the top of the "dam."

In applying this method it must be done before the ground begins to move. It cannot be applied to ground that is actually moving. Moreover, the wall must go sufficiently deep to get into solid strata. But there is nothing except cost to prevent such an underground dam from going as deep as seems desirable, or to make the holes as large or the tie rods as heavy as desired. It would be desirable to try the method beyond the present slide areas in order to determine the obstacles and necessities of the case. The work could be pushed from either edge into the slide area. Intermediate ground walls could be constructed further up the slopes, so as to lessen the weight and also to prevent water which might enter above from working down into the larger mass below. Accompanying these dams, underground horizontal drifts might in some cases be put into the slopes to drain the ground.

Selkirk Tunnel Under Way

THE actual work of boring the six million dollar tunnel for the C. P. R. railway through the Selkirk mountains on Rogers Pass has begun. Special trains carrying steam shovels and other equipment are on their way to the scene of operations. It is estimated by the contractors, Messrs. Foley, Welch & Stewart, that the plant necessary to perform the task will cost $500,000.

Work is to be carried on simultaneously from both sides of the mountains. Huge ventilating fans will supply the men at the headings with fresh air and for the first half mile of the tunnel compressed air locomotives will haul up the rock. As the work advances this work will be done by small steam locomotives. A new style drill is to be used and the importance of getting the most efficient type can be readily seen when it is understood that 250,000 cubic yards of rock must be removed.

A large force of men will work through the present summer and autumn preparing the actual approaches to the tunnel. Two miles of track at the east and three miles of track at the west end will lead to the approach cuts. The cuts themselves are about a quarter of a mile long. It is hoped that it will be possible to begin the actual boring by the autumn. The character of the rock and the quantity of water to be encountered are uncertain factors but the contractors look forward to finishing in three and a-half years.

Recent experiments at Boston, Mass., went to prove that sawdust is useful as a fire extinguisher. It was found to be very successful in quenching fires in oil, and much superior to sand for fires in tanks of inflammable liquids. Experiments were conducted with tanks of burning lacquer, though the same principles appear to apply largely to tanks of burning oil. The floating sawdust forms a blanket that shuts off the air from the flames; and sawdust itself catches fire only slowly, and then does not burn with a flame. The sawdust blanket was completely successful in putting out the fire in these tests. It made no difference whether the sawdust was wet or dry.

Engineering News.

Letters Received for Publication

Municipal Engineering Society Proposed—A Complaint Registered—Boring Record

Editor, Contract Record:

The announcement of the annual meeting of the American Society of Municipal Engineers made me curious to know if there were organizations of similar character in Canada.

After glancing over a list of Canadian technical societies I was able to make a rough analysis of the professions they represent. Out of about seventy societies, sixteen are associated with general engineering, three represent electric engineers, etc., architects have seven societies, land surveyors have six, mining engineers three, gas engineers one, railway engineers three, chemists one, and the remainder are associated with builders, astronomers, stationary engineers, good roads, smoke abatement, peat, forestry, cement, and miscellaneous, numbering in all about eighteen. The Mayor, Aldermen, Councillors, and Town Clerks have ten societies organized to represent their views and wants. It is worthy of note that there is one Public Health Association in Canada, and this is said to consist largely of medical men.

Canada is a large country, with a population of about eight million people. The health of the communities, where human activities are so pronounced, is of vital importance, yet, the last named association is the only one which has been established in this country, primarily in the interest of public health. The municipal engineers, however, as an organized, coherent body of officials, do not exist at all. In Canada, therefore, at the present time, so far as I am able to ascertain, there is no organization which has specially the right to represent and voice the views of the important profession of municipal engineers.

Why is this so? Is there a good sound reason for the absence of such a representative society? Is the immensity of Canadian territory a deterent to a prosperous institution? After studying the situation, the writer was forced to the conclusion that it was because each municipal engineer had as much as he could do to carry on his own professional duties, and consequently, had but little time or occasion to think of such an organization. Furthermore, they dwell and work at distances, more or less great from each other, with the result that the engineer in British Columbia, for instance, rarely meets his confreres in the Prairie Provinces, much less have many opportunities of conferring with those in the East. If this applies to engineers working in the West, but whose native home is in the East, then it is still less probable that those living and working in the East get frequent opportunities for visiting works in the West. There is no inducement, at present, for them to make the trips. This, however, is not a strong reason for the absence of a Canadian institution of municipal engineers, but is a powerful argument in favor of its immediate formation. The vastness of this country renders it even more desirable that engineers should combine and by means of an organized effort, eradicate the present tendency to insularity caused by their isolation from engineers in other cities and provinces.

Many of these engineers have occasion at one time or another, however infrequent, to visit other towns and cities, and to inspect various works of interest to themselves, and by making the most of their individual opportunities, they are able to secure valuable information which tends to show them that different engineers have different ways of achieving similar results. But if an institution was formed and meetings were held at different centres, the benefits would be collective and not individual.

In the field of general engineering, there is probably an ample number of societies, and for almost every phase of engineering in Canada,—except municipal engineering—there is a representative organization.

According to the Dominion census of 1911, there were one hundred and seven cities and towns in Canada having a population of 4,000 and over. This was an increase of 45 per cent. over 1901. The increase in population has been much greater during the last five years than in any other similar period, and it is safe to reckon that the number of towns and cities of 4,000 inhabitants and over will by 1921 be about two hundred.

Most of these towns employ an engineer, some of them also have departmental engineers, and I may venture to estimate that there are at present from three to five hundred engineers engaged on municipal works in Canada, who owing to the non-existence of a distinctly representative society, common to practically every other class of men, are left to their own resources and initiative.

A Canadian Institution of Municipal Engineers might include city engineers, municipal, electric, water, drainage, road, street railway, gas and other engineers. Perhaps consulting engineers engaged on municipal undertakings would be allowed to join. The only qualification, which would probably be needed (especially at the commencement) would be that the applicants either hold principal civic appointments or are engaged on municipal works. The members could, of course, be divided into classes according to their individual qualifications and occupations, if it was thought desirable.

Such an institution would meet in different cities, at least once a year (the oftener the better) where papers would be read by the engineers describing the works undertaken by the city, and these works would be inspected and explained, questions would be invited and answered and a general discussion would take place.

It is often the case, in other societies, that a free discussion affords more useful and comparative information than is to be found in the paper itself. Such discussions are good, the weak and strong points of any scheme are brought out prominently, for in the multitude of counsel there is often much wisdom. Discussion also broadens the mind, enlarges the horizon of thought and develops the reasoning faculty; it is also educational to both the speaker and audience alike, it creates a healthy and generous rivalry, and establishes a standard of excellence which by mutual accord becomes higher each year and which will inevitably reflect credit on the profession generally, and give greater satisfaction to the public for whom we work. Such discussion would be of immense advantage to the engineers and to the authorities; the latter would not only secure an excellent advertisement, by virtue of the official visit of the society, but what is of even greater value, the town authorities would hear criticisms and obtain information useful for future operations.

Later on, the institution could, if it was deemed desirable, organize examinations in the theory and practice of municipal engineering and in municipal law.

Such a society would tend to weld together the band of municipal engineers to their own direct benefit, and the town authorities, by sending their engineers to the meetings, would in every way reap great advantages, because the educational and social aspects of such meetings would be conducive to mutual interest, efficiency, confidence, progress and esprit de corps among the officials.

As a former municipal engineer of thirty years standing, I heartily acknowledge that the many associations of which I have been a member for many years, have been of inestimable value, not only by virtue of the publications received, but also by the friendly, intellectual and social intercourse with brother engineers, and by the free interchange of ideas, thoughts and datas.

Considering that enormous sums of money are annually spent by municipal engineers, of various classes, and that so much depends on the efficiency of their works in the direction of public health, public utilities, and public amenities, it might seem strange that active steps to combine had not long since been taken. An official who is perforce to follow solely his own ideas—ploughing his lonely furrow—without seeing what has been done by others in the same sphere of operations, is apt to fall behind and develop the spirit and sentiment of the proverbial cobbler who never went beyond the confines of his own little village.

Whilst in the early stages, it might perhaps, be found possible to form only provincial institutions, the formation of a powerful Dominion institution should be advocated, for in union there is strength and in co-operation there is prosperity. The aim and object of the promotion should be to force it to become a power in the land and that the opinions, transactions and developments of the institution should carry weight and tend to create an appreciative public opinion on the inobtrusive work carried on by engineers in the Dominion. Such an institution, if rightly directed and loyally supported in its initial stages, would soon reach the position when its power and influence would be felt outside the circle of engineers.

At present if any Canadian engineer desires to meet in conference, men of similar vocation, he has to cross the International Boundary, where, of course, he will see much to his advantage, and though he will certainly receive a warm welcome and a great hospitality, he cannot help but feel a sense of loneliness in the crowd. If, however, a representative society were to make an official visit to the same town the members would not only receive even greater welcome and more bountiful hospitality, but the members would also not feel as if they were lost in the multitude but rather as if they were members of a great family.

From a national point of view, moreover, we should be patriotic enough to be in a position to announce that we have similar societies in Canada, for certainly we have much to be proud of in the number of municipal works, which we can visit. The suggested Canadian Institution of Municipal Engineers if formed, could occasionally pay an official visit to a city across the line, just as the gas engineers visited Toronto last year and the American Society of Civil Engineers visiting Ottawa this month. This is a graceful manner of recognizing the internationality of the engineering profession.

I do not know what are the views of the Municipal Engineers on this subject, I have spoken to a few and they appear to be favorable to the suggestion, but it will be advisable to have a free discussion before anything is done in the matter. Perhaps the Editor will throw open the columns of this journal for such purpose.

In conclusion, I have to state that I have had the privilege of assisting in the formation of at least three engineering societies in different parts of the British Empire. If I can be of any service in helping to form such an institution as I have endeavored to describe, it will afford me much pleasure to do so. I, however, fully believe that there are plenty of engineers who are willing to do what is required, when it is felt that there is a desire for such an organization.

Thanking you for the opportunity of presenting the foregoing plea for a representative organization of municipal engineers.

R. O. Wynne-Roberts,
Consulting Engineer, Regina.

(Editor's Note.—We quite agree with Mr. Wynne-Roberts as to the value and benefits of an organization of the nature described in his communication and should be pleased to publish any correspondence bearing on the question).

June 28, 1913.

Editor, Contract Record:

In your issue of May 28th there appeared an advertisement over the signature of the Mayor and the City Commissioners of Moose Jaw, Sask., for tenders for street pavements, concrete walks, curbs, gutters, etc., to close June 6th, one of the conditions being that a marked cheque for two and one-half per cent. should accompany each tender.

A tender for all the work at reasonable prices would amount to approximately two hundred thousand dollars, the marked cheque required would therefore be, say, $5,000.

In company with other unfortunates the writer wended his way out to Moose Jaw, paid his railway fare out, lived well at a first-class hotel—and by the way, they have a first-class hotel—and paid his fare back, without having the satisfaction of knowing whether his tender was low, high, or in the middle. Before going farther it might be pointed out that neither the railways or hotels in the west take "promises to pay," you must settle in cash, and it is surprising how many people seem to have the cash, although it is claimed that money is scarce. Well, the long and short of it is that the Moose Jaw Council a day or two after the tenders closed determined not to go on with the work after they had succeeded in bringing a number of paving men to their city to spend money on hotels, ball games and picture shows. Without further word of explanation the council decided to "return all tenders unopened." One representative with a little more nerve than the rest tried to get permission to address the Council, but was refused. He told me afterwards that he was going to ask them if they would recoup him for his expenses seeing that they invited him to come.

This is the point the writer wants to make: If City Councils are so anxious to have "marked cheques," "bonds," "guarantees," "retained payments," etc., etc., from prospective contractors on civic work, why do they not use more horse-sense in scattering their invitations to tender before they are ready to receive the tender either for financial or other reasons, thus eliminating the waste of time and money in figuring on work which cannot possibly be proceeded with, or have they the idea that the various paving contractors enjoy that kind of thing? If that is their idea of the paving business it might be suggested they call a convention of paving men, give them a good time showing them around the city, etc., and let them air their views on civic matters. Undoubtedly these city fathers would get some splendid ideas, especially upon the advertising for tenders, the methods of opening tenders, the awarding of contracts ,etc.

The writer has been in the paving business for about fifteen years, and has had experience in possibly a hundred cities and towns in Canada and the United States, but this last experience is a new one to him. It may be depended upon that he saw that his tender was "returned unopened," and if he tenders again in Moose Jaw, and he is fortunate enough next time to secure the contract, the citizens of that progressive burg will pay the expenses of both trips—do you blame him?

Did you ever attend a council meeting and hear the city fathers discuss and pass an item of a million dollars in two minutes, and then take an hour to decide the question as to whether they would rebate $3.00 collected for taxes in error? And then did you ever go home and wonder why it is that a city cannot be run the same way that any of our railroads, banks, manufacturing establishments, insurance companies, and steamship companies are run?

Some day I expect to write a book on this most interesting subject, so what is the use of further remarks?

Thanking you for the space, I am,

Yours very truly,
A Pavingman.

Brooks, Alta., June 28th, 1913.

Editor, Contract Record:

On page 45 of your issue of June 11th, you state that 810 feet of hard rock tunnelling in thirty days is the American record. Allow me to inform you that you are mistaken. The American record for hard rock tunnelling was somewhere about 900 feet a month made in very hard blue shale on the Gunnison Tunnel in Colorado built by the United States Reclamation Service, and if you will be good enough to write to the Director of the United States Reclamation Service, Washington, D.C., you can get the official record.

Yours truly,
E. E. Sands.

Reports from Western Cities

The city council of Regina has added to its already extensive programme of public works further improvements involving an expenditure of over half a million dollars. The greater part of this sum is to be spent on sewers and watermains. An incinerator is to be installed and sixteen specially designed cars for the conveyance of the garbage purchased. Street car lines are also to be extended. In addition to the civic work several large business firms have undertaken extensive work. Excavation has begun on the Sherwood departmental store. This structure when completed will cost $1,000,000. Excavation for the million-dollar Grand Trunk Pacific Railway hotel is practically completed and the construction of this 14-storey building will begin immediately. The city authorities have set aside a suitable site for the armouries and the work will begin immediately, at an estimated cost of $300,000. Among the other buildings now under construction may be noted the Winter Fair Building, at a cost of over $100,000, the Canada Life 6-storey building and two Roman Catholic churches.

Fort William

This important lake port continues its rapid growth. Mr. M. A. Ryan, president of the National Boiler Works Company, of Superior, Wis., has secured a site for the erection of a boiler manufacturing and structural steel industry. It is proposed to erect a building 140 by 260 feet and to give employment at the first to sixty men. The Dominion Government, which has already spent an enormous sums on Fort William harbour, has appropriated $2,000,000 for further harbour improvements. The Ontario Government is pushing the work on road building in the immediate vicinity. The Pigeon river road, which is to connect Fort William with Duluth, is the scene of great activity and the work will be carried to the international boundary line by fall.

Port Arthur

Building and engineering operations on a large scale are reported from Port Arthur. Work is to be carried on by the Dominion Government, the Provincial Government, the city itself and by private parties and business concerns. The Dominion Government will spend $3,000,000 in the constructive and engineering work required to improve the harbor and shipping facilities and $150,000 on a Customs Building and new Armouries. The Provincial Government is devoting itself to the improvement of the roads adjacent to the city and is spending a very considerable sum. The civic officials are adding ten miles to the street railway system to form what is to be known as the Belt Line, and have plans out for the extension of the sewer and waterworks system to the amount of half a million dollars. A large number of private residences are in course of construction. An office block, two large store blocks and the Oddfellows' Hall are also under way and represent an investment of nearly three-quarters of a million dollars. The city has just completed an agreement with a large company for the building of a flour mill and elevator, having a daily capacity of 2,500,000 barrels.

New Government Building at Ottawa

The Dominion Public Works Department in providing for the new Government buildings to be erected at Ottawa has decided to call for competitive plans. Mr. T. E. Colcutt, the British architect, has been appointed to collaborate with several prominent Canadian architects in arranging for the competition. Mr. Colcutt was nominated for this position by the Royal Institute of British Architects. This well known designer has had a wonderful career. In 1896 he was sent by the British Government to Johannesburg to arrange for the erection of a university. Later he aided in planning of the Palace of Peace at the Hague. In England his work is seen in the Imperial Institute at South Kensington, London, the Savoy Hotel and Lloyd's Registry Offices in Fenchurch street.

Mr. Colcutt is a past president of the British Institute, a member of the Society of Des Artistes Francaises and also a member of the Belgium Architectural Society. He is the holder of the King Edward gold medal and won the Grand Prix at the last Paris Exhibition for desiging artists. Mr. Geo. Moenton-Sharp, who was a successful competitor in recent important British Columbia work, is a pupil of Mr. Colcutt, while Mr. Leonard Stokes, who has been engaged by the Manitoba Government in connection with the new Provincial House of Parliament, is a partner.

The gentlemen collaborating with Mr. Colcutt at Ottawa are J. C. Marchand, of Montreal, and J. G. H. Russel, of Winnipeg. All are meeting to-day at Ottawa to settle the conditions upon which the competition, open to the British Empire, shall be conducted.

The new department buildings will be created on the bluff of the Ottawa River to the west of the present departmental group. The Government has accepted the ground plan prepared by the English landscape architect, Edward White. It now remains to prepare designs for the buildings which are to occupy the site already acquired by the government.

A prize of $3,000 will be awarded to each of the first five in the competition. For the $3,000 each of them will be required to prepare working plans. After this has been done the judges will go over the five sets of plans and to the one which is adjudged the most meritorious will award the great prize of the competition. This will be an order to supervise the construction of the building or buildings at the usual architect's fee.

Canadian and American Roads

The International Congress recently held in London, Eng., on the invitation of the British Government brought together many prominently interested in building and maintenmanc of good roads.

Mr. Rees Jeffreys, the well-known secretary of the British Government Road Board, brought back some interesting suggestions from his recent Canadian trip. Here for instance is one of his comments:

"In Canada the unit of road administration is the County, which is, I understand, a poor authority. You must, I think, create authorities sufficiently large to command the services of competent officials. The second point to be insisted on is that the secret of good roads is continuous maintenance.

"I found that in the United States and in Canada good roads had been built and not maintained afterwards—a sheer waste of money. Roads need continuous attention, like machinery, or your original capital expenditure is wasted. If the provinces in Canada are going to provide for road construction, they must also take steps to secure their proper maintenance when made.

"The best roads I saw in the United States were in Massachusetts, where the State is the road authority and maintains the roads. In other states, where the state had built good roads and had handed them over to counties to maintain, the roads were often neglected. The result was that a large percentage of the capital expenditure had been wasted.

"It cannot be too strongly asserted that the supreme authority in the finances and supervisions of roads should be a large body. The tendency to-day is towards centralization, and the supreme authority should be a Government Department, composed of capable men chosen because of their ability and not by reason of their politics."

The Canadian representatives include the Hon. J. E. Caron, Quebec, Minister of Agriculture and Roads; a representative of the Saskatchewan Government; Mr. W. A. McLean, of the Ontario Government Engineering Staff; Mr. Howard A. Turner, Road Superintendent, Okanagan Valley, B.C.; Mr. George Janin, Chief Engineer of the Public Works Department of Montreal; Mr. G. W. N. Day, Editor of the Contract Record and Engineering Review, of Toronto, and Mr. Stanley D. Robinson, of Hamilton, Ontario.

Pedlar People Staff Changes

In keeping with the policy of this house as originated and developed by the late Mr. Geo. H. Pedlar, additions to the force at Oshawa headquarters have been made recently, which will further increase the efficiency of an already strong and capable organization.

Mr. W. R. Geikie, formerly branch manager of The Pedlar People, Limited, at Toronto, who possesses a thorough knowledge of financial matters gained through a long experience with the Dominion Bank as manager of various branches, will in his capacity of managing director, bring this ample knowledge into good use, together with his experience in selling sheet metal products as manager of the branch at Toronto. With this excellent business equipment Mr. Geikie should be able to gauge the situation correctly as applying to trade conditions in sheet metal lines.

The Operating Department has been strengthened by the addition of Mr. W. Loach, formerly connected with the management of Canada Foundries Limited, Toronto. This new official has a wide and varied mechanical and manufacturing experience in the United States and Canada. Several new developments are now under way, which will be of general interest to the trade when particulars are announced.

A further addition has just been made in the person of Mr. A. T. Enlow, now in general charge of sales and advertising. Mr. Enlow is a steel man of large experience, having been connected with the manufacture and sale of steel in the United States for the last twenty years. He was plant manager for the United States Steel Corporation, at Cambridge, Ohio, and later sales manager of Berger Mfg. Company, and general sales manager of The Stark Rolling Mill Company, both at Canton, Ohio, While acting in the latter capacity Mr. Enlow developed and marketed the famous anti-corrosive Toncan Metal Sheets, for which The Pedlar People, Limited, are Canadian distributors.

Messrs. W. H. Hall and F. L. Mason, who were prominently associated with the late Mr. Pedlar in the development of the Pedlar People sheet metal products, have already proven their worth. It is quite safe to say that the addition of these three experienced men means the continuation of the policy which has kept the firm at the head of sheet metal working activities in Canada and abroad.

Famous Paintings from Germany, Britain, United States and Canada

The display of paintings at the Canadian National Exhibition draws lovers of the beautiful from all parts of America.

In the galleries are gathered the best works of Canadian and United States artists, and the great galleries of Europe loan their treasures to further enhance the value of the collection.

This year the galleries will be divided into four sections; British, German, American and Canadian, and the entire exhibit promises a distinct advance on the previous great collections that have featured the Canadian National.

Mainly Constructional

Mr. T. Aird Murray has prepared an exhaustive report on York Lake, Yorkton, Sask., as a probable source of water supply.

Building permits for the first six months of 1913 at Welland, Ont., amounted to $225,000, an increase of $100,000 over the same period of 1912.

A new building by-law is being prepared for Regina which, while not making many radical changes, will be worded in simpler terms so as to prevent misunderstanding.

For the month of June the Montreal building permits totalled $2,278,424, against $1,718,505 for the corresponding month last year. The figures for the half year show a value of $9,442,288 as compared with $8,065,993 in 1912.

On behalf of a company, Mr. P. W. St. George has made a proposal to the city of Montreal to take over the garbage. The idea is to utilise a portion of the garbage for generating steam for commercial purposes, and also to extract grease and fertilisers from other portions.

Hon. J. O. Reaume, Minister of Public Works, of Ontario, stated recently that no move would be made by the Government to outline its policy for the improvement of roadways in old Ontario until Mr. W. A. Maclean, Provincial Engineer of Highways, returns from his present trip to Europe, where he is attending the International Roadways Conference.

Judgment in favor of Messrs. Wills, the contractors for the Canada Central Railway, has been given by Mr. Justice Archibald, Montreal. There has been litigation between the parties concerning the construction of the line, and the result is that, by the ruling of the judge, the company are restrained from either undertaking the work on their own account or from handing it to another contractor.

The proposed new Registry Office for Toronto, which is to be erected in the block bounded by Chestnut, Louisa, Elizabeth and Albert streets, will be one of the finest on the continent. The proposed entire cost of the building, including heating, ventilation, plumbing, lighting, and architect's commission, is to be $350,000. It will be two storeys in height and be built in the centre of the block. The dimensions of the building cannot be determined until the drawing is made by the architect, but the dimensions will likely be about 120 feet on the south and north sides by 150 feet depth.

The Department of Public Works of the province of Quebec is constructing a new bridge over the Yamaska River at the city of St. Hyacinthe. This structure is intended to replace the old wooden bridge that spanned the river at that point and calls for an 18-foot roadway between wheelguards and two suspended sidewalks 4 feet wide outside each truss with steel lattice fence railings on the outer line of the sidewalks. The plans and specifications were prepared by L. A. & Ivan E. Vallee, engineers of the Department of Public Works and Labor. The Dominion Bridge Company is carrying on the work of construction.

The Department of Public Works, Ottawa, has received plans for the construction of the new entrance to Rideau Hall, the Vice-Regal residence at the capital city. There was some agitation for an entirely new residence on a new site at Rockcliffe but this was not favored by the Government at present. The addition in which is situated the new entrance will be 96 feet long and three storeys in height. The portion of the old building to the rear of the entrance is to be altered in layout and made fireproof and extending in height to three storeys. The suggested changes have received some adverse criticism on the part of architects.

A very large deputation representing counties on the south shore of the St. Lawrence have asked Sir Lomer Gouin, the Premier of Quebec, to aid in the construction of a national highway to link up Quebec, Sherbrooke and Montreal, passing via Sherbrooke and Richmond, and connecting with a link from Richmond to Sherbrooke with the proposed road to the American border, and another link from Sherbrooke via Magog and Waterloo to Granby, the whole road to be about 240 miles in length. The Premier stated that the Government approved of the road, but that aid would have to be given in turn with other road projects before the government.

In an action for damages against the City of Montreal, Mr. Justice Archibald has decided that a city is not obliged to construct sewers which will meet all possible contingencies; it is only bound when it constructs a sewerage system in any given locality, to do so in a careful way to the best of its judgment, after having secured the advice of qualified engineers. Owing to the insufficiency of the sewers to meet an extraordinary demand upon them a cellar was flooded, and $412 was claimed. It was also shown that the plaintiff's cellar was a foot deeper than was allowed by the city regulations and that the interior drainage was not equipped to meet an unusual flow in the sewers.

Western Pavers Limited were recently awarded contracts for approximately seventeen miles of curb and gutter construction in the city of Regina, having just completed a former contract. This company have also somewhere in the neighborhood of thirty miles of curb and gutter work in the city of Edmonton working steadily for four contractors, besides a $75,000 sidewalk contract in the city of Saskatoon and work of a similar nature throughout the Prairie Provinces. Western Pavers Limited is under the management of a former Torontonian, Mr. Chas. Curtis, having worked for a number of years in the City Hall and subsequently as secretary-treasurer for the Bitulithic Company.

The Cook Construction Company, of Sudbury, Ont., and A. B. Wheaton, of Amherst, are joint contractors for the Halifax Terminal Railway at a contract price of $1,500,000. The line is five miles in length, and is to run from Rockingham to the site of the proposed terminal works. It will in effect be part of the Intercolonial, but will be known as the Halifax Terminal Railway. The contract is to be in two sections, one at a million and the other at half a million. The two contracting firms are taking it over jointly. A great deal of excavation will be necessary, and it is the intention to use all the rock and dirt on the harbor work and in the construction of the sea pier which will be necessary in connection with the new docks.

A portion of the present old canal will be completely closed by the construction of the new Welland Ship Canal. A dam will be thrown across the old channel at Allanburg, and from this point to Marlatt's Bridge the old canal will be used as a dumping ground. Should navigation on the lower portion of the old canal be desired later, a cut thereto from the present canal at lock 25 could be made. The clay from the deep cut south of Allanburg will be thrown into the dump thus formed, and the stone from the rock will be utilized in building a great breakwater at Port Colborne. The harbor there will be deepened to meet the depth of the new channel, which will be 25 feet. The width at the bottom will be 200 feet.

After some delay, the Montreal Board of Control has awarded a contract for the widening of the city aqueduct to the Cook Construction Company, of Sudbury, Ont., at the price of $2,322,552. The next lowest tender was that of Quinlan & Robertson, of Montreal (who carried out a previous contract for work on the aqueduct), their price being $2,621,180. Representations were made in favor of the work being given to the local firm, it being suggested that the work could not be done at the price tendered by the Cook Construction Company. This was denied, but with a view to satisfy the council, the company have agreed to give further guarantee for the completion of the work in addition to the $200,000 originally deposited.

According to a controller of the city of Montreal, the engineers appointed by the city to carry out tests have reported in favor of the site selected by Messrs. Hering & Fuller, of New York, for the filtration plant. The contractor, Mr. N. McLeod, asserted that the ground was unsuitable—was in fact composed of a kind of sand—and his contention was backed up by four of the most eminent engineers in Montreal. It was also said that certain damage to a portion of the plant was due to this cause, while the city asserted that it was owing to the lack of precautions during the winter. The controllers thereupon appointed Messrs. Jamieson, Barbour & St. George to investigate, and the result of their tests is stated to negative the contentions of the contractor.

The new plans for the Gerrard street bridge, Toronto, call for a bridge of three arch spans whereas the first plan which was approved of in February was composed of an arch over the Don only with girder approach spans. The reason for the change in that in the investigations of the Works Department there it was found that the subsoil shows the former mentioned plan to be the most suitable. According to the Commissioner of Works the three arch span bridge practically eliminates any unbalanced thrust, whereas the former plan would be subject to this condition. "This is especially objectionable owing to the limited space available for the piers and the extremely loose material which these piers would have to support them near the top," says the Commissioner.

Under the ruling of Mr. Justice Demers, Montreal, the Association of Architects of the Province of Quebec is a closed corporation, and those practising without being registered members are liable to a penalty. Two test cases have just been decided. The defendants, Messrs. A. H. Paradis and A. Trudel, claimed that, being qualified architects by experience and training, they were not compelled to go through the formality of registering as members of the Province of Quebec Association. The law dealing with such registration, they maintained, applied only to those who, in the words of the article, "held their title in virtue of this law." Defendants represented that as they held their title of architect in virtue of certificates conferred by American Institutes of Architecture, they did not fall under the operation of this law.

The association, on the other hand, maintained that the architectural profession, in virtue of the law referred to, was placed on the same footing as the legal and medical professions. Thus, before a person could engage in practice, he must first be registered as a member of the association, which was a closed corporation.

His Lordship, in deciding for the plaintiffs, imposed a penalty of $1 and costs.

Canadian Railroad Development

The laying of steel has reached Whitby on the new Lake Shore line of the Canadian Pacific. This makes a continuous track from Agincourt. A large turnout of citizens witnessed its arrival and great interest was shown in the event.

Before winter the Canadian Pacific Railway will be running a double-track service between Toronto and Guelph Junction, a distance of 31 miles, and next year will see another lap covered on the way to Detroit, 189 miles farther west.

According to a statement by Mr. F. P. Gutelius, the general manager of the Intercolonial Railway, it has been decided to reduce the grade of the line. The work will be done at the rate of 100 miles per annum. Certain portions of the line will have to be reconstructed, and it is also intended to double track as required. Mr. W. A. Duff has been appointed chief engineer of bridges of the I. C. R., having just concluded an engagement on the Transcontinental as assistant chief engineer.

According to an announcement by Sir Thomas Shaughnessy, the C. P. R. will appropriate, in the current year, a hundred million dollars for the construction of additional railway mileage, for cars and locomotives, terminal facilities at St. John, Montreal, Toronto, Fort William, Winnipeg, Calgary, Vancouver and elsewhere, for ocean steamships and hotels, extensions of the telegraph system, shops, sidings, and improvements generally in Canada. This sum will not be all spent during 1913, but the improvements will be carried out as rapidly as possible.

Despite the statements of railroad officials that the Essex Terminal Railroad will not be extended to Amherstburg, the Ontario Government engineers making the preliminary survey are laying out a line to that place. The Government engineers have not received definite directions as to whether the railroad will go to the full length of their survey, but they are making it to be prepared if such should be the case. An earlier survey which brought the railroad close to the river at Ojibway is being run over again at a further distance from the shore. This would indicate that larger yards are wanted by the Steel Trust.

The Federal Government have decided to at once commence the public works promised for the city of Quebec, which include the building of a tunnel, with entrance at Wolfe's Cove to St. Malo, to connect with the Union passenger station; the Transcontinental Railway workshops at St. Malo; a grain elevator in the vicinity of Priest's wharf, Champlain street; docks for shipping accommodation, and a passenger and freight depot for local traffic. The tunnel will be through rock, a mile long, and will admit of a double-tracked railway. The contract will be carried out by Messrs. M. P. and J. T. Davis, who are building the sub-structure of the Quebec bridge.

A number of new ammendments to the original order of the Railway Commission in regard to railway fire protection were approved of at a meeting of the board this morning. The most important amendment, and practically the only one objected to by the railways, was that limiting the extent of territory on each side of a railway track within which railways would be responsible for fire to 300 feet. To this Mr. Flintoff, for the C. N. R., objected that it would make "beautiful ammunition for a jury trial." The Chairman pointed out, however, that up to the present the railway might be held responsible for an indefinite stretch of territory, which was now to be limited.

The new Canadian Northern line from Quebec, via Montreal and Ottawa, to Port Arthur will be ready for traffic by the time navigation closes this year. This will take the completed road through to the summit of the Rockies in British Columbia. The railway thence to Vancouver will probably be completed two or three months later. Something of the vigor and enterprise with which the railway is now pushing its great undertaking to an early conclusion may be seen in the following statement. The pay sheets of the week just closed showed that a total of 8,921 men and 1,249 horses were engaged on the various sections now knitting the line together to the summit of the Rocky Mountains. This already mammoth force the railway expects to further augment during the next two months.

The aim of the International Railway management is to create a six-tenth grade from the city of Montreal to Halifax and Sydney, and this change can be brought about at the rate of about one hundred miles each year, according to F. P. Gutelius, general manager of the Government Railway system, in his official statement, after a trip over the system, accompanying the Minister of Railways and Canals. The change of grade will be brought about on short stretches of the I. C. R. For instance, some twenty miles of the line from Point Tupper to Sydney will have to be rebuilt, but this would not be more than twenty-five per cent. of the distance from the Strait of Canso to Sydney. The big change will be made between Truro, N.S., and Amherst, which section takes in the famous Foleigh Mountain stretch.

Personal Mention

Before leaving for Ottawa, Mr. Archibald Currie, the late city engineer of Westmount, P.Q., was presented with a gold watch, locket and chain by the staff of the road department and engineers' office. Mr. P. E. Jarman, who has been appointed acting engineer, made the presentation on behalf of a committee.

Mr. Collingwood B. Brown, who has been appointed chief engineer of the Government railways, is a graduate in civil engineering of Cornell. He is a Canadian by birth, having been born in Kingston, Ont., 36 years ago. For 14 years Mr. Brown has been in the employ of the C. P. R., and now resigns the position of principal assistant engineer with that company to enter the Government service.

J. W. Orrock, divisional agent for the C. P. R. at North Bay, has been appointed to succeed C. B. Brown in the position of principal assistant engineer of the C. P. R. at Windsor Station. He will begin his duties here as soon as he can be relieved at North Bay. It is expected that a local man will replace Mr. Orrock. Mr. Brown has gone to Moncton to assume the position of Chief Engineer of the Government railways, to which he was recently appointed.

Mr. Albert Nuttall, formerly Erection Superintendent, Structural Steel Company, and for the last two years Superintendent of Construction for Canada of the Cleveland Bridge Company, has been appointed Superintendent of Erection, Bridge Department of Canada Foundry Company, Limited, with headquarters at Toronto.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Waterworks, Sewerage and Roadways

Bracebridge, Ont.
Cement walks, for Board of Education. Tenders received by Sec.-Treas., Alex. C. Salman, until July 15th.

Guelph, Ont.
Drainage planned by City Council and G. T. R. G. T. R. Engineer, Mr. Mitchell. City Clerk, T. J. Moore.

Owen Sound, Ont.
Sidewalks, cost $2,280.20, for town council. Tenders received by Chairman of Commission, Jas. C. Grier, until July 11th. Plans at office of Clerk, Chas. Gordon.

Sewers, cost $1,270.40, for town council. Tenders received by Chairman of Commission, Jas. C. Grier, until July 11th. Plans at office of Clerk, Chas. Gordon.

Peterboro, Ont.
Paving, George and Charlotte. Plans in progress. Clerk, S. R. Armstrong. City engineer, W. R. Parsons, Simcoe St.

Stratford, Ont.
City Council plan pavements, curbs, excavation and base, on Caledonia St., Construction Service Co., Ltd., Quebec St. E., Guelph. Curbs, excavation, etc., on John and St. Vincent streets and Linton ave., to Board of Works. (Ald. Pauli, chairman). Engineer, A. B. Manson.

Toronto, Ont.
Sewers, cost $9,730, contemplated by Board of Control. Brandon, Lightbourne and Chandos avenues. Mayor, H. C. Hocken, City Hall. Clerk, W. A. Littlejohn.

Sewers, cost $45,360, for Board of Control. Mayor, H. C. Hocken, City Hall. Sewers on Glenmount, Park road, Brookside Drive, Beachview crescent, Firstbrook road, Burgess and Gibson Aves.

City will construct number of sewers in Glebe Manor Dist.; Oswald, Servington and Cuthbert Cres., Belsize Drive, Wharram Place, Wilfred and Thurloe Aves. Board of Control. Mayor, H. C. Hocken, City Hall.

Walkerville, Ont.
Concrete pavements, for town council. Tenders received by Clerk, Cecil H. Robinson, until noon July 11th, for pavements on a number of streets. Engineer, Owen McKay.

Welland, Ont.
Concrete walks on Myrtle, Maple, Cross, William and Asher streets, and Parkway Heights. Passed by council. Clerk, Geo. R. Boyd. Engineer, D. T. Black, Main St. S.

Winnipeg, Man.
Wells, for the Rural Municipality of St. Vital. Sec.-Treas., J. Desourdis. The digging of public wells for water supply by means of pump at the following places, N.E. corner of Guay Ave. and Rue des Meurons, S.E. corner of Rue Youville and Guary Ave., N.W. of Princess Ave. and Egerton road.

CONTRACTS AWARDED

Berlin, Ont.
Pavements, cost $51,628, for city council. Clerk, A. H. Miller. Engineer, Herbert Johnston. General contractors, Warren Bituminous Paving Co. of Ont., Limited, 103 Bay St., Toronto.

Bowmanville, Ont.
Sewage disposal works, for town council. Mayor, S. C. Hillier. Clerk, John Lyle. Engineers, Chipman & Power, Mail Bldg., Toronto. General contractor, John F. Connolly, 606 Avenue road, Toronto, Ont.

Montreal, Que.
Electric lighting, waterworks and sewerage planned by Town Council of Point Claire. General contractors, Laurin & Leitch, 5 Beaver Hall Sq. Steel pipe, Drummond, McCall & Co., 28 Victoria Square.

Malden Twp., Ont.
Tile drains and bridge, cost $4,000, planned. As a result of no tenders being received the council has instructed Councillor Pillon of Maden Centre to do the work by day labor.

Wingham, Ont.
Storm sewers, for town council. Mayor, Mr. VanStone. General contractors, T. J. McLean & Co. General contractors also awarded contract for cast-iron sewer on Catherine St.

Railroads, Bridges and Wharves

Addington, Ont.
C. P. Rly. Co. has been authorized to construct bridge No. 65.4 near Addington Station, Havelock Sub-Div., Ontario Division.

Calgary, Alta.
Canadian Pacific Railway Company has been authorized to construct spur for the Cockshutt Plow Co., Ltd. To be completed by Sept. 30, 1913.

Dundas, Ont.
Switches, etc., planned for Hamilton & Dundas, and Toronto, Hamilton & Buffalo Railways. Further information from George Waller, Hamilton and Dundas Railway Company, Hamilton.

Railroad construction, cost $50,000, planned by G. T. R. New freight and passenger yards, freight sheds, passenger station in West Flamboro Twp.

Galt, Ont.
G. T. Rly. Co. has been authorized to construct siding into premises of Galt Stove & Furnace Co., Ltd. To be constructed by Sept. 19th, 1913.

Huron County, Ont.
Four bridges planned by County Council. Clerk, William Lane, Waterloo St., Goderich, Ont. (a) bridge on line between Howick and Wallace Twps; (b) bridge on line between Turnberry & Culross Twps; (c) rebuilding bridge between Stephen and Bosanquet Twps; (d) "Corbett" bridge on line between Stephen & McGillivray, jointly with Middlesex Co. 20-ft. span.

Hamilton, Ont.
C. P. Rly. Co. has been authorized to construct bridge No. 1.1 on Hamilton Sub-Div., Ontario Division.

Normanby Twp., Ont.
Steel bridge, cost $16,000. Reeve, Mearns, Hanover, Ont. Plans in progress.

Osborne Twp., Ont.
Twp. council, Clerk, F. Morley Whalen, Ont., contemplate repairs to bridges.

Oshawa, Ont.
Tunnel planned by Town Council and C. P. R., 30 ft. x 14 ft. 6 in., overhead bridge over C. P. R. Clerk, Thos. Morris. Town Engineer, Frank Chappell. Work done by owners.

Ottawa, Ont.
Steel pontoon gate lifter, for Dom. Govt. Dept. of Railways and Canals. Tenders received by Sec., L. K. Jones, Ottawa, until 16 o'clock July 29th. Gate lifter for Trent Canal. Plans, etc., at office of Chief Engineer Dept. Railways and Canals, and at office of Supt. Engineer Trent Canal, Peterboro, Ont.

Province of Quebec.
Bridge, cost $4,500, over Petite Riviere, for Municipal Council of L'Ange Gardien. Plans, etc., at office of Sec.-Treas., W. Chartrand. One span 40 x 17, concrete, steel and 4-in. red pine. Mayor, Octave Demers.

Bridge, cost $2,800, over Chicot Rover, planned by Municipal Council of Berthier. Plans, etc., at office of Sec.-treas., Theo Gervais. One span, 75 x 17, concrete, steel and 4-in. red pine. Mayor, Michel Desy.

"Morin" bridge, cost $4,900, over St. Peter Creek, for Municipal Council of St. Paul Joliette. Mayor, Jean M. Forest. Plans, etc., at office of Sec.-treas., Jos. Vennes. One span, 50 x 17, concrete, steel and 4-in. red pine.

Bridge, cost $2,000, over Mill River, for Municipal Council of St. Francois. Mayor, Ed. M. Roberge. Secretary-treasurer, F. X. Lepage. One span, 15 x 16, concrete, 5 12-in. I-beams, 40 lbs. 19-in. long 4-in. red pine. Plans drawn.

Bridge, cost $6,150, over Eusibe River, Demeules Twp., for Municipal Council of St. Felicien. Mayor, Flavien Coulombe. Plans, etc., at office of Sec.-Treas., Neree

Perron. One span, 50 x 17, concrete, steel and 4 in. red pine.

Bridge, cost $4,700, over Coulie River, planned for Municipality of St. Jean Baptiste de Nicolet. Plans, etc., at office of Sec.-Treas. One span, 30 x 16, concrete, 5 18-in. I beams, 55 lbs., 34 ft. long, 4-in. red pine.

Bridge, cost $6,760, for Municipal Council of Twp. Shipton. Sec.-Treas., C. C. Brown. Engineer, L. A. Vallee, 80 St. Cyrille St., Que. One span, 166 x 17, concrete, steel and 4 in. red pine. Bridge over Little River Nicolet, at Nicolet's Falls.

Bridge, cost $2,900, over S. Branch of Yamaska River, for Township of Brome. Plans, etc., at office of Sec.-Treas., Geo. F. Hall. One span, 30 x 17, concrete, 5 18-in. I beams, 55 lbs., 34 ft. long, 4 in. red pine.

Bridge, cost $3,500, over River Veillette, for Municipal Council of Ste. Genevieve de Batiscan. Mayor, E. St. Arnaud. Plans, etc., at office of Sec.-Treas., W. T. Trudel. One span, 30 x 16, concrete, 5 18-in. I beams, 55 lbs., 34 ft. long, 4 in. red pine.

Sunnidale Twp., Ont.

Twp. Council plan culverts on the 9th, 10th and 11th concessions.

Valleyfield, Que.

Concrete wall, Beauharnois Canal, for Dom. Govt. Dept. of Railways and Canals. Tenders received by Sec., L. K. Jones, Ottawa, until 16 o'clock, July 18th. Plans, etc., at office of the Dept. of Railways and Canals, Ottawa, and at office of Supt. Engineer, Quebec Canals, Montreal, Que.

CONTRACTS AWARDED

Acton, Ont.

Bridge, for county council. General contractor, K. Cooper. 18-in. span cement arch bridge.

Ft. William, Ont.

Freight shed, cost $7,000, for Imperial Oil Co. Builder and general contractor, S. J. McQueen.

Montreal, Que.

Widening aqueduct, for Board of Commissioners. Sec., L. N. Senecal. General contractors, Cook Construction Co., Sudbury, Ont. Engineer, Geo. Janin, City Hall.

Ottawa, Ont.

Booster Bldg., cost $6,000, Centre, for Ottawa Electric Railway, Albert street. Architect, J. Albert Ewart, 193 Sparks street. General contractor, Geo. Crain, 285 Clemow. Solid brick construction, cement foundation.

Sandwich West, Ont.

Three bridges. Reeve, Reni Laframboise. Engineer in charge, M. N. Drouillard. General contractor, Wilfrid Renaud.

Public Buildings, Churches Schools, etc.

Brantford, Ont.

Dormitory building, for Prov. Govt. Dept. of Public Works. Tenders received by Sec., H. F. McNaughton, Parliament Bldgs., Toronto, until July 15th, for all trades except heating, plumbing and electrical wiring. Plans at office of Ontario Institution for Blind.

Calgary, Alta.

Locker room, cost $16,000, for County Club. Architects, Lawson & Fordyce, Norman Block. Plans ready.

Edmonton, Alta.

City market building, cost $110,960, 1st Street, for City Council. Architect, A. Jeffers. Market Supt., Mr. Robertson. One storey and basement, 32 x 100, brick and hollow construction, 2 refrigerators, projecting roof.

Guelph, Ont.

Poultry building, for Prov. Govt. Dept. of Public Works. Tenders received by Sec., H. F. McNaughton, Parliament Bldgs., Toronto, until July 15th, for all trades except heating, plumbing and electric wiring. Plans at office of O. A. C., Guelph.

Haileybury, Ont.

Court house and registry office, for Prov. Govt. Dept. of Public Works. Tenders received by Sec., H. F. McNaughton, Parliament Bldg., Toronto, until July 15th, for all trades except heating, plumbing and electric wiring. Plans at office of Sheriff.

Hamilton, Ont.

Labor temple, cost $30,000, for Trades of Labor Council. Sec., Walter Rolls. Plans under consideration.

Addition to school, cost $5,000, for Separate School Board, c/o Father Maloney, St. Mary's Presbytery. Architect, J. D. Corrigan, Catharine, N. Brick addition, general alterations.

Montreal, Que.

Diamond Hall, cost $10,000, Pt. St. Charles (Fortune ave. near Wellington), for Orangemen's Lodge. Architect, M. Campbell, C.E., P. O. Box 385. Foundation work, Dube & Marot, c/o architect. Three storeys, 23 x 75. Excavating started.

Kindergarten school, cost $50,000, Eleanor and Ottawa, for R. C. School Commissioners, 86 St. Catherine W. Plans in progress.

Oak Bay, B.C.

School, Willow District. Board have instructed Architect, P. L. James, to call for tenders for erecting a temporary school and shed.

Saskatoon, Sask.

Loft building, cost $250,000, for Dr. G. E. Holmes, 323 6th Avenue N. Architect, F. J. O'Leary, Willoughby Sumner Block. Six storeys and basement, reinforced concrete and brick construction, marble stairway, fireproof throughout. To be used for manufacturing purposes. Tenders will be called about July 14th to 20th.

Tillsonburg, Ont.

Carnegie library, for town council. Chairman of building committee, Al. Hogarth. Plans in progress.

Toronto, Ont.

School repairs. Tenders received by Secretary, W. C. Wilkinson, Board of Education, until July 11th. Full information from Supt. of Buildings.

School and offices, planned by Board of Education. Sec., W. C. Wilkinson. The Property and Advisory Committee have decided to recommend to the Finance Committee that an Administrative Bldg. and a combined public and open-air school be erected on the College-Orde street site.

Tenders received by Secretary, W. C. Wilkinson, Board of Education, until July 11th for steam boilers, also Fountain Taps, for Dufferin school.

Messrs. Stevens & Lee, College street, are preparing plans for the erection of the new Wingham Hospital, at Wingham, Ont.

Weigh scales, for Board of Control. Tenders received by Mayor, H. C. Hocken, City Hall, until July 15th, for weigh scales at St. Lawrence Market.

CONTRACTS AWARDED

Banff, Alta.

Bath house, cost $75,000. Dom. Govt. Dept. of the Interior. Sec., Lyndewade Pereira, Ottawa, Ont. Architects, Painter & Swales, 553 Granville St., B. C. General contractor, R. Brocklebank, Bell Block, Calgary.

Belleville, Ont.

Dormitory building, for Prov. Govt., Dept. of Public Works. Tenders received by Secretary, H. F. McNaughton, Parliament Bldgs., Toronto, until July 15th, for all trades except heating, plumbing and electric wiring. Plans at office of Ontario Institution for Deaf and Dumb.

Calgary, Alta.

Ranchman's club, 13th Ave. and 6th St. W., for Ranchman's Club. Architect, R. E. McDonnell, 11 Edge Block. Concrete work, Foster Cartage Co., 523 14th Ave. west.

Edmonton, Alta.

Plumbing for school, for Public School Board. Sec., M. Brady. Plumbing, Edmonton Metal Works, at $38,590.

Ft. William, Ont.

Addition to club house, cost $30,000, George street, for Kamistikwia Club. Architect, Carl Wirth. General contractors, Marsh & Powers.

Guelph, Ont.

Dining hall, cost $60,000, for Prov. Govt. Dept. of Public Works. Sec., H. F. McNaughton, Parliament Bldgs, Toronto. General contractors, P. H. Secord & Son, 137 Nelson street, Brantford. Dining hall in connection with Agricultural College.

Hamilton, Ont.

Alterations to church, cost $13,000, James street south, for James St. Baptist Church. Pastor, Rev. J. J. Ross, 85 Queen south. Architect, H. H. New, Spectator Bldg. Carpenter, Stewart Bros., Hyde Park Ave.

Addition to church, for St. Ann's R. C. Corporation. General contractor, T. J. Drake, 49 Earl street.

Macleod, Alta.

Addition to school, cost $15,000. Sec.-Treas., E. F. Brown. Architect, Mr. Whiddington, Lethbridge. General contractor, J. S. Lambert. Two storeys, 53 x 34, stone foundation, brick construction.

Montreal, Que.

School, cost $137,000, for Commissioners Scolaire St. Madelein d'Outremont. Architects, Viau & Venne, 76 St. Gabriel. General contractors, carpentry, iron and steel and painting, E. N. & M. Boileau, 374 Garnier. Roofing, heating, plumbing and electrical work, G. Champagne & Bros., 78a Inspector.

School alterations, 696 St. Urbain, for Parish of Notre Dame Sisters, 696 St. Urbain. Mason and carpenter, M. St. Onge, 696 St. Urbain. Alterations to window frames and stone work.

Orillia, Ont.
Public building, cost $40,000, for Dom. Govt. Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa, Ont. General contractors, Simcoe Construction Co., Simcoe, Ont.

Ottawa, Ont.
The Department of Public Works, Ottawa, have awarded the general contract for alterations to Rideau Hall to Messrs. Peter Lyall Co.

Elevator, cost $8,250, for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa, Ont. General contractor, A. G. Marshall, 5 O'Conner St. New elevator for west block.

Saskatoon, Sask.
Exhibition building, cost $150,000, Fair grounds. Architects, Thompson, Daniel & Colthurst, Central Chambers. General contractors, Smith Bros. & Wilson, for 2 wings, costing $28,000, brick, tile and mill construction.

Scarboro, Ont.
School, cost $7,000, for Trustee Board. Architects, Munro & Mead, Chancery Chambers, Hamilton. General contractor, George Sainsbury, Weston, Ont.

Toronto, Ont.
Alterations to building for club quarters, cost $20,000, 19 Wellington west, for American Club. Sec., P. A. Fitzpatrick, 119 Wellington west. Architect, J. F. Wegman, c/o Darling & Pearson, 2 Leader Lane. General contractors for alterations, Standard Structural Company, Manning Chambers.

Walkerton, Ont.
Public library, cost $10,000, Durham. Builders and general contractors, R. E. Truax & Son. Mason, Obright Bros. Foundations started.

Winnipeg, Man.
Lockers, cost $4,736, for Public School Board, William and Ellen streets. Sec.-Treas., R. H. Smith. General contractor, W. T. Grose, 905 Elec. Rly. Chambers. For 320 double lockers for Kelvin and St. John High Schools.

School, Clifton street, for Board of Education. Architect, J. B. Mitchell, Commissioner of School Bldgs., William and Ellen street south. General contractors, Sutherland Construction Co., 512 Builders' Exchange. 30 rooms, brick construction.

Beef cattle barns, St. Vital, for Prov. Govt. Dept. of Public Works. Minister, Hon. Colin H. Campbell. Architect, V. W Horwood, 261 Fort street, Winnipeg. General contractors, Cota & Bencit, St. Boniface. To be erected in connection with the Manitoba Agricultural College.

Westboro, Ont.
Church, cost $11,000, for Presbyterian Congregation. Pastor, Rev. W. H. Cram. Architect, J. P. MacLaren, 104 Sparks street, Ottawa. Mason, H. H. Cowan, 16 Armstrong, Ottawa. Carpenter, Low & Raitt, 148 Percy, Ottawa. Painting, P. Stewart, Bank, Ottawa. Electrical, Marchand & Donnelly, Sparks, Ottawa. Plasterer, Bowman & Son, Ottawa. Heating and plumbing not let yet.

Business Buildings and Industrial Plants

Coquitlam, B.C.
Hotel, cost $60,000, for Coquitlam Terminal Co., 533 Granville St., Vancouver. Architects, Parr, MacKenzie & Day, Vancouver Block, Vancouver. Two storeys, brick veneer construction.

Edmonton, Alta.
Stables, 1st St., for city council. Architect, A. Jeffers. 38 in. wide and long enough to house 100 teams, brick construction. To be erected in connection with new market building.

Hamilton, Ont.
Store apartments and mill, cost $12,000, Barton E., for Dunlop-Magee Co., 125 John St. S. Architects, F. Jas. Rastrick & Son, 30 King E. Mason, R. Isbister, 125 Wellington S. Three storeys, 28 x 70.

Store, cost $4,500, Prospect street and Maple ave., for W. H. Hunter, c/o architect, L. A. Wardell, 110 Hunter St. W. Plans drawn.

Montreal, Que.
Store, cost $9,000, Mt. Royal, for O. Gratton, 323 Stuart, Outremont. Architects, Gauthier & Daoust, 180 St. James. Masonry, Paul Asconi, c/o owner. Iron, Phoenix Bridge Co., 83 Colborne. Owner will call tenders for plumbing, heating, electrical work, painting, etc., as work progresses. Three storeys and basement, 24 x 100, concrete foundation, brick construction.

Two stores and flats, cost $10,000, Notre Dame W., for L. Cohen & Son, 36 Prince street. Architect and builder, C. W. Strang, 76 Plymouth Grove. Steel, Dom. Bridge Co., Lachine. Plumbing, E. B. Rae, 1074 St. James. Builder will receive tenders for roofing, electric, galvanized iron and plastering.

Factory, contemplated, for Union Switch & Signal Co., 611 Canadian Express Bldg. Plans will be prepared.

Storehouse, 529 Ontario E., of Baillargeon Express Co., 329 Ontario E., destroyed by fire. Loss, $10,000.

The Forrester Co., 33 Notre Dame W., Montreal, contemplate building a factory.

Nelson, B.C.
Jno. Blemberg contemplates replacing the present frame hotel by a modern 4-storey structure.

Regina, Sask.
Straw board mill planned for the Flax Products Co., who will manufacture building paper, wall board, chip board and straw board.

Sudbury, Ont.
Bowling alley and pool room, cost $4,500, for D. Moren. Architects, Angus & Angus, North Bay. One storey and basement, 23 x 80, brick construction, cement foundation. Plans in progress.

Toronto, Ont.
Store and residence, cost $6,000, High Park, for J. M. Cowan, 65 Adelaide E. Two storeys, 26 x 38, structural steel and brick construction, stone foundation. Plans drawn.

Vancouver, B.C.
Hotel, Pender and Main. Architects, Parr, MacKenzie & Day, Vancouver Block. Architects will receive both general contract and separate tenders. Owner, name withheld.

West Lorne, Ont.
Creamery contemplated by John Skinner & Son. Equipment required. Plans will be prepared.

Windsor, Ont.
G. Adams contemplates erecting theatre and stores to cost $12,000 on Wyandotte.

E. Lyens requires complete interior equipment for new gents' furnishing store. Architects, Leybourne & Whitney.

Winnipeg, Man.
Bank, cost $25,000, Main street and Bannerman, for The Merchants Bank of Canada. Architect, Jno. D. Atchison, Trust & Loan Bldg., Portage Ave. General contractors, G. A. Fuller & Co., 1001 Union Bank Bldg. Steel, Manitoba Bridge & Iron Works, Logan Ave. W. Roofing, A. B. Ormsby Ltd., 677 Notre Dame. Electrical, Shipman Elec. Co., Ltd., 396 Portage Ave. Two storeys, 31 x 64, pressed brick and terra cotta construction.

CONTRACTS AWARDED

Amherst, N.S.
Drug store, Victoria, for Douglas Bros. Architect, J. L. Allen. General contractor, J. N. Fage. Three storeys, concrete and spruce floors.

Brantford, Ont.
Warehouse, cost $5,000, Elgin. Builder and owners, Ham & Nott Co., Ltd. One storey, 73 x 210, corrugated and structural iron construction.

Calgary, Alta
Motion picture theatre, 1st St. W., for Dr. Lindsay, c/o Architects. Architects, Hubbell Kelly Co., Centre street. General contractors, Fyshe, McNeill, Martin & Trainer, Loughead Bldg. Two stys., 50 x 100, fireproof construction throughout.

Edmonton, Alta.
Store, cost $4,000, 1st Ave. S.W., for S. Swarty, 136 1st Ave., N.W., South Edmonton. Architect and general contractor is owner. One storey, 30 x 40, concrete foundation, brick construction.

Fort William, Ont.
Starch works, cost $750,000, Island 2, for Ft. William Starch Co. Architects and general contractors, Canadian Stewart Co., Ft. William. Reinforced concrete, mill, iron and Soho brick construction. Foundations in.

Warehouse, cost $5,000, for D. W. Dwyer Ltd., Ottawa and Fort William. Builder, D. A. Gordon. One storey, frame and galvanized iron construction.

Drying plant, cost $8,000, Pacific, for N. M. Patterson & Co., Graham and Horne Block. General contractors, owners, day labor. Crib iron clad construction, cement foundation.

Hamilton, Ont.
Addition to building, cost $8,000, for Pure Milk Corporation, John Street N.

General contractor, George F. Webb, 136 Stinson street. Permit granted.

Alterations to hotel, cost $12,000, King street, for Staunton Bros., Revere House, King street east. Architect, A. W. Peene, King street west. Mason, Isbister Bros., 195 Wellington street south. Carpenter, J. F. Mercer, 125 Hunter St. S. Roofing, Dennis & Jocelyn, 13 Walnut street south. Painting, F. W. Kirk, 205 Carlton ave. west. Plastering, J. Clapham & Son, 69 Hughson St. N. Furniture required.

Addition and alterations to store, cost $15,000, for Dominion House Furnishing Co., 118 James N. Architect, W. A. Edwards, 2 Hughson St. S. General contractor, Geo. E. Mills, 614 King E. Stone foundation, brick construction, store front.

Addition to factory, cost $5,000, Barton E., for Malcolm Souter Furniture Company, Barton E. Architects, Stewart & Witton, H. P. & L. Bldg. General contractors, Mitchell & Riddell, 91 Peter St. Carpenter, Jno. Vogan, 280 Sanford Avenue N.

Addition and alterations to restaurant, cost $3,000, King St., for H. L. Bowles, 149 Yonge St., Toronto. General contractor, Samuel Howard, Mary St. White enamel bricks, tile floors, store front, billiard room, brick bakery in rear.

London, Ont.

Bake shop, cost $40,000, for D. S. Perrin Co. Manager, T. McFarlane. Architect, J. M. Moore, 435½ Richmond St. General contractor, J. Putherbough, 1002 Wellington. Five storeys, white brick construction, stone and cement foundation.

Montreal, Que.

Stores and flats, cost $10,000, St. Viateur and Esplanade, for S. Rosenveesen, 182 Peel street. Designer, C. Dupont, c/o owner. General contractor, M. Fromson, 68 Colonial ave. Foundations in.

Auto factory, cost $12,000, Maisonneuve, for Messrs. Pontbriand & Fils, Sorel, Que. General contractor, Mr. Wm. Boivin, Montreal. Two storeys, 100 x 60, steel and elastic brick construction.

Garage, cost $20,000, 789 Berri, for Lavoie & Lavoie, 789 Berri street. Builder, Cyclops Construction Co., 96 Notre Dame St. W. Four storeys, 51 x 67, cement foundation, brick construction.

Store alterations, cost $30,000, 483 St. Catherine W., for Fairweathers Limited, 487 St. Catherine W. Architects, MacVicar & Heriot, 104 Union Ave. General contractor, M. F. Fromson, 68 Colonial ave. Four storeys, 30 x 85. Changing all interior and store front.

Warehouse, cost $5,000, Latour, for Geo. W. Reed & Co., Ltd., 37 St. Antoine. Owner doing all work. Three storeys, 46 x 46, concrete foundation, brick and mill construction.

Offices, alterations, St. Catherine and Parthenais, for Canada Linseed Oil Co., Ltd., 1224 Notre Dame E. Architects, Hutchison, Wood & Miller, 50 Royal Insurance Bldg. General contractor, E. Meloche, 304 Eighth Ave., Rosemount. Three storeys, 45 x 100, stone, brick and structural steel construction.

Garage and store, 668 St. Catherine W. for Stockwell Motor Co., St. Catherine and Crescent. Architect, J. A. Godin, 269 St. Denis. General contractors, Mount Royal Construction Co., St. Denis. Brick and masonry, John Dominique, 360 St. Antoine.

Store and flat, cost $4,500, Dandurand. Owner and builder, Arthur Clermont, 516 8th Ave., Rosemont. Two storeys, 25 x 40, cement foundation, brick construction. Excavating started.

Ottawa, Ont.

Warehouse, cost $63,000, York, for S. J. Major & Co., York street. Architect, C. P. Meredith, 126 Sparks street. Painting, J. Duford, Rideau street. Heating, plumbing and electrical not awarded yet. Plastering, Frank Hunt, 115 Arlington.

Stores and offices, cost $600,000, Sparks for Blackburn Estate, Sparks street. Architect, W. E. Noffke, Central Chambers. General contractors, Blackburn Bros., Sparks street. Ten storeys, store fronts and fixtures, bank and office fixtures, grill work, vaults, safes, vacuum cleaners, fire escapes, ventilating and annunciator systems.

Garage and alterations to residence, cost $10,000, for F. W. Carling, Metropolitan Bldg. Architect, C. P. Meredith, 126 Sparks street. Mason, F. McCullough, 181 Waller. Carpentry, Taylor & Lackey, 21 First ave. Solid brick construction.

Business building, cost $190,000, Queen, for Ottawa Evening Journal, Elgin St. Architect, A. L. Weeks, 75 Sparks St. General contractors, Shuttleworth & Black, Queen street.

Port Arthur, Ont.

Stores and offices, cost $425,000, for Jas. Whalen & Co., Port Arthur. Architects, Brown & Vallance, 32 Canada Life Bldg., Montreal. General contractors, Canadian Stewart Co., head office, Montreal. Seven storeys, 100 x 90, reinforced concrete, tile and pressed brick construction. Two passenger elevators, plate, prismatic and art glass, vaults, vacuum cleaners, fire escapes and extinguishers, ventilating system, boilers.

Quebec, Que.

Repairs to shoe factory, cost $7,500, 591 St. Valir, for Ludger Duchaine, 591 St. Valier street, Que. Architect and general contractor, Magloire Cauchon, Dorchester. Three storeys, 75 x 125, stone foundation, structural steel and brick construction.

St. John, N.B.

Warehouse and office, Prince Wm., for McClary Mfg. Co. Manager, G. S. Bishop, Chipman Hill. General contractor, owner.

Toronto, Ont.

Factory, Collier street, for S. G. Thompson (in trust) 793 Yonge street. Architect, H. G. Salisbury, 12 Adelaide E. General contractor, R. G. Kirby, 539 Yonge street. Three storeys, 50 x 65.

Theatre, cost $6,000, Dundas and Gilmour. Builder and owner, A. Rappaport, 2165 Dundas street. Architect, T. A. Fleming, 94 Laws street. Carpentry day labor. Heating, electric wiring, plumbing not yet awarded. Theatre to be opened Sept. 1st. 600 seats required. Owner wants prices.

Bank, cost $10,000, 442 Yonge St., for Royal Bank of Canada, Yonge St. Architect, F. S. Baker, Royal Bank Bldg. Masonry, Jas. Wickett, Ltd., 28 Toronto street. Carpentry, Walker & Roberts. Steel, Dominion Bridge Co., Imperial Life Bldg. Painting, J. McCausland & Son, 11 Nelson street.

Alterations to offices, cost $13,000, Bay and King, for Mail Printing Co., King and Bay. Architect, G. M. West, 78 Homewood. Carpentry, Geo. Henry & Son, 153 Rusholme Road. Painting, A. E. Phillips, 46 Richmond E. Heating & plumbing, Fiddes & Hogarth, King E. Plastering, Taylor & Nesbitt, 18 Havelock. Two storeys, structural steel, reinforced concrete and brick construction.

Addition to warehouse, King W., for Warwick Bros. & Rutter, 401 King W. Architects, Steele & Sons, Stair Bldg. General contractors, Harris & Harris, Confederation Life Bldg. Four storeys, 100 x 50, structural steel and brick construction.

Windsor, Ont.

Bank, remodelling, cost $15,000, Ouellette, for Royal Bank of Canada. Manager local branch, Geo. Mair. Architect, Kenneth G. Rea, 54a Beaver Hall Hill, Montreal, Que. General contractor, J. R. Sulland, Windsor and Sault St. Marie. Terrazzo floors and marble border, hot water heating, plumbing, plate glass, bank and office fixtures, grille work, two vaults.

Winnipeg, Man.

Stores, cost $8,000, Notre Dame, for A. E. Ewart, 208 Bank of Nova Scotia. Architects, Jordon & Over, 47 Canada Life Bldg. General contractors, Sutherland Construction Co., 211 Carlton Bldg. One storey, 60 x 50, brick construction and foundation. Excavating started.

Bank building, cost $35,000, Transcona (Regent & Vaughan), Bank of Commerce, Winnipeg. General contractors, Dominion Realty Co., Transcona. Two storeys, 35 x 47, brick, cement foundation.

Remodelling hotel, cost $10,000, Garry, for A. E. Hanna, 287 Garry street. Remodelling part of interior into an up-to-date cafe.

Addition to bank building, Main, for The Merchants Bank of Canada. Architects, Jno. D. Atcheson & Co., Trust & Loan Bldg. General contractors, Geo. A. Fuller Co., Ltd., 1001 Union Bank Bldg. Steel, Dominion Bridge Co., Canada Bldg. Tile floors, Dom. Fireproofing Co., 525 Union Bldg. Plumbing, Edmonton Metal Works, at $38,537.

Horse barns, St. Vital, for Provincial Government, Dept. of Public Works. Minister, Hon. Colin H. Campbell. Architect, V. W. Horwood, 261 Fort St., Winnipeg. General contractors, Carter-Halls, Aldinger Co., 1010 Union Bank Bldg., Winnipeg. To be erected in connection with the Manitoba Agricultural College.

Store and residence, cost $3,800, Redwood ave. Architect and builder, owner. One storey, 31 x 52, stone foundation, frame construction.

Residences

Calgary, Alta.

Two residences, cost $6,000, Roxborough Place, for Adanac Building Company. Architects, Burrows & Richards, Crown Block. Two storeys, 30 x 30, brick foundation, frame construction.

Residence, cost $6,000, 15th ave. W., for I. K. Kerr, 12th ave. west. Architects, Swanstrom Co., 323 Travis Block. One storey, 30 x 56, cement foundation, frame construction.

Hamilton, Ont.

Residence, cost $7,000, 369 Queen St. S., for Mrs. A. M. Adams, c/o architects, Stewart & Witton, 7 Hughson St. S. Brick construction. Plans drawn.

London, Ont.

Residence, cost $7,000, Oxford, for W. W. Gammage, 759 Maitland street. Architect, A. E. Nutter, Dom. Bank Bldg. Two storeys, white and pressed brick construction. Plans ready.

Mount Hamilton, Ont.

Residence, cost $10,000, for Adam Inch. Plans drawn.

Montreal, Que.

Residence, cost $16,000, Outremont (Hutchison near Van Horne), for H. Blais, 6526 Frimeau, Ahunstic. Three storeys, 50 x 77, stone construction.

Montreal West, Que.

Residence, cost $8,000, Wolseley, for C. S. Jones, Strathearn Ave., Montreal W. Owner will call private tenders for heating, plumbing and roofing. Two storeys and basement, 25 x 35, cement foundation, encased brick construction.

Moose Jaw, Sask.

Residence, cost $6,000, Alberta ave., for Arthur A. Frost, c/o architects, Reid & McAlpine, Howden Block. Two stys., 37 x 38, cement foundation, brick veneer construction.

Residence, cost $4,000, for Geo. Gledhill, c/o architect, T. Carmichael, Russell Block. Two storeys, 22 x 26, concrete foundation, frame construction.

Ottawa, Ont.

Residence, cost $7,000, First ave., for J. A. Grieson, 209 Centre street. 2½ stys., 35 x 35, brick construction, stone foundation. Plans in progress.

Residence, cost $5,000, Mutchmore, for Geo. H. Lett, 19 Ella. 2½ storeys, 19 x 35, brick veneer construction. Plans being prepared.

Sandwich, Ont.

Rectory for Central Methodist Church. Pastor, Rev. F. W. Hollinrake. Chairman of Commission, O. E. Fleming. Plans under way.

Toronto, Ont.

Four residences, cost $16,000, Gothic ave., for S. B. Read, Weston, Ont. Architect, P. H. Finney, 79 Adelaide St. E. 2½ storeys, brick construction and foundation. Plans in progress.

Residence, cost $6,300, Belsiz, for Mrs. F. S. Hodge, c/o architect, Allan George, 67 Victoria. Contracts not yet awarded. 2½ storeys, 24 x 38, brick construction and foundation. Tenders in.

Two detached residences, cost $7,000, Westmount, for R. L. McAffee, 338 Sunnyside. Architect, J. H. Stanford, Bloor and Ossington. 2½storeys, 20 x 42 and 20 x 38, brick construction. Plans ready.

One detached residence, cost $6,000, for J. A. Slade, 179 Bathurst street. Architect, L. Foulds, King and Leader Lane. 2½ storeys, 22 x 38, brick construction. Plans ready.

Three attached residences, cost $7,000, Givens, for F. Hunnisett, 214 Crawford street. Architect, J. B. Matson, 63 Argyle street. 2½ storeys, 47 x 42, brick construction. Plans ready.

Two detached residences, cost $8,000, Rosemount, for Fleischauer & Kappes, 93 Yonge street. Owners superintend all work. 2½ storeys, 22 x 36, brick construction.

Vancouver, B.C.

Apartments, English Bay, for Hampton & Edgar, 532 Granville. Eight stys., 132 x 90, reinforced concrete construction. Dennison block tile. Plans prepared.

Walkerville, Ont.

Residence, cost $8,000, Devonshire, for F. C. Thrall, c/o Wilt Twist Drill Co., Walkerville. Tenders received by architect, R. H. Marr, 1529 Ford Building, Detroit, Mich. Two storeys, 30 x 36, stucco, tile and structural steel construction.

CONTRACTS AWARDED

Calgary, Alta.

Two residences, cost $7,000, Missim, for P. Bersymann, Rohl Block. Architects, Alberta Investment & Insurance Co., 514 Burns Block. General contractors, owner. 19 x 38, cement foundation, frame construction.

Edmonton, Alta.

Residence, cost $12,000, Athabasca ave., for W. D. Ferris, 768 23rd street. Architect and general contractor, J. R. Ferris, 43 Jasper ave. east. Two storeys, 40 x 48, concrete foundation, frame construction.

Fort William, Ont.

Apartment block, cost $25,000, Brodie N., for Chas. G. Jenkins, 711 Victoria ave. Architect, R. E. Mason. Mason, D. Kendal. Three storeys, 50 x 55, pressed and common brick construction.

Apartment block, Brodie N., for Chas. G. Jenkins. Architect, R. E. Mason. General contractor, Chas. E. Ward. Three storeys.

Hamilton, Ont.

Two residences, cost $20,000, King St. E., for L. W. Ruduck, 37 Oxford street. General contractors, W. J. Workman & Sons, Bank of Hamilton Bldg. Brick construction.

London, Ont.

Residence, cost $6,000, Waterloo, for N. H. Keene, 186 Oxford street. General contractor, Jno. Nutkins, 721 Elias street. Two storeys, white brick and stucco construction, stone and cement foundation.

Two residences, cost $8,000, Richmond. Builder and owner, G. W. Kennedy, 326 St. George street. Two storeys, white brick construction.

Medicine Hat, Alta.

Twenty-five residences, for E. D. Bennett, Toronto street. Architect and general contractor, A. Dickinson, Hull Blk. is erecting 25 residences at Crescent Heights.

A. Dickinson, Hull Block, is erecting ten residences.

Montreal, Que.

Residence, cost $6,000, Oxford ave. Builder and owner, Henry Gaffney, Rm. 23, 204 St. James. Two storeys, 44 x 36, cement foundation, brick construction.

One pair residences, cost $18,000, Westmount (Roslyn ave.). Owner and builder, J. H. Hand, 609 Belmont ave. Two storeys and basement, 50 x 65, cement foundation, brick construction. Excavating started.

Residence, cost $6,000, Westmount (Western), for Dr. A. Munro, 61 Drummond St. Architect, D. J. Spence, 46 Beaver Hall Hill. General contractor, R. Manson, 381 Victoria. Two storeys and basement, 21 x 60, cement foundation, cut stone and brick construction.

Residence, cost $25,000, Westmount (Aberdeen ave.), for R. C. Patton, 421 Mackay. Architects, Cox & Amos, E. T. Bank, St. Catherine W. General contractor, D. M. Long, 39 Windsor. 2½ storeys and basement, 33 x 64, stone foundation, pressed brick construction.

Two flats, cost $8,000, King Edward ave. Builder and owner, Chas. M. Ward, 2168 Waverly. Architect, J. McDonald Aiken, 772 St. Urbain. Two storeys, 65 x 48, concrete foundation, brick construction.

Three flats, cost $7,500, 2nd ave., Rosemont, for Joseph Capistian, 2634 Drolet. Architect and builder, owner. Three storeys, 50 x 40, brick construction.

Flats, cost $10,000, Outremont (near 850 Durocher). Builder and owner, Lacasse Deslauriers & Bourgeois, 2224 St. Louis or 167 Cartier. Three storeys, 25 x 74, cement foundation, brick construction.

Residence, cost $15,000, Outremont (Durocher near Van Horne). Builder and owner, O. Briere, c/o P. P. Daunas, 1927 St. Urbain. Three storeys, 50 x 73, stone foundation, brick construction.

Residence, cost $15,000, Outremont (Ainslie), for A. S. Lavallee, 101 St. Lawrence Blvd. Architect, Chas. Bernier, 70 St. James street. Mason, J. Latreille, care owner. Roofing, heating & plumbing, T. Latourelle, 6 Craig St. W. Electrical and painting not let. Carpenter, P. Brouillet, 79½ Elizabeth.

Residence, cost $21,000, Westmount, (Sydenham), for E. E. Belcourt, 4371 Montrose ave. Architect, R. E. Bostrom, McGill Bldg., Montreal. General contractor, A. K. Hutchison, 4404 St. Catherine, is looking after the whole job. Two storeys and basement, 25 x 60, brick construction.

Residence, cost $20,000, Westmount (Redfern ave.), for Mr. Jas. Laurin, of Laurin & Leitch, 5 Beaver Hall Sq. Architect and builder, owner. 2½ storeys and basement, 33 x 80, cement foundation, brick construction. Excavating done.

Montreal West, Que.

Residence, cost $5,500, for W. T. S. Burnes, Builder and general contractor, L. R. Maurice. Two storeys, 25 x 55, cement foundation, brick construction.

Ottawa, Ont.

Residence, cost $7,000, Park, for W. G. Davis, c/o Architect, Albert Blythe, 80 Park ave. General contractor, W. C. Smith, 482 Kent. 2½ storeys, 32 x 36, brick veneer construction, stone foundation.

Residence, cost $6,000, Sweetland. General contractor and owner, Karl Cohen, 232 Somerset. 2½ storeys, 32 x 42, brick construction.

Residence, cost $7,000, Russell, for T.

(Continued on page 75)

Tenders and For Sale Department

CITY OF PRINCE ALBERT,
SASKATCHEWAN

Tenders will be received, addressed to the City Clerk, Prince Albert, Sask., until noon, Wednesday, July 16th, 1913, for the following contracts:

13 D—Laying approximately 22,000 feet of steel water main.

13 E—Laying approximately 25,000 feet of steel water main.

13 F—Laying approximately 26,000 feet of sewers.

13 G—Laying approximately 25,000 feet of sewers.

Plans and specifications are on file at the office of The Canadian Engineer, Union Bank Building, Winnipeg, and at the office of the City Engineer, Prince Albert. Instructions to bidders and form of tender may be had on application to the City Engineer. Plans and specifications not to be sent out.

The lowest or any tender not necessarily accepted.

M. H. BAKER, City Engineer.
N. W. MORTON,
H. E. M. KENSIT,
C. O. DAVIDSON, City Commissioners.
Prince Albert, Sask.,
June 23rd, 1913. 27-28

Department of Railways and Canals, Canada

TRENT CANAL

Steel Pontoon Gate Lifter

Notice to Contractors

Sealed tenders addressed to the undersigned and marked "Tender for Steel Pontoon Gate Lifter, Trent Canal," will be received at this office until 16 o'clock on **Tuesday, July 29th, 1913.**

Plans, specifications and form of contract to be entered into can be seen on or after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Superintending Engineer, Trent Canal, Peterborough, Ont.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labour, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of $1,000, made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES.
Asst. Deputy Minister and Secretary.
Department of Railways and Canals,
Ottawa, 25th June, 1913.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.—44228. 27-28

Sealed tenders addressed to the undersigned and endorsed "Tender for Public Building, Lakefield, Ont.," will be received until 4 p.m., on **Monday, July 21, 1913**, for the construction of a Public Building at Lakefield, Ont.

Plans, specifications and form of contract can be seen and forms of tender obtained on application to the Postmaster at Lakefield, Ont., at the office of Mr. Thos. Hastings, Clerk of Works, Postal Station "F," Yonge St., Toronto, and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, June 26, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—42451. 27-28

Sealed tenders addressed to the undersigned, and endorsed "Tender for Public Building, Hanover, Ont.," will be received until 4 p.m., on **Monday, July 21, 1913**, for the construction of a Public Building at Hanover, Ont.

Plans, specification and form of contract can be seen and forms of tender obtained on application to the Postmaster at Hanover, Ont., at the office of Mr. Thos. Hastings, Clerk of Works, Postal Station "F," Yonge St., Toronto, and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signature, stating their occupations and places of residence. In the case of firms the actual signatures, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, June 26, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—42596. 27-28

Tenders Wanted

Tenders for the construction of Cement Abutments for a proposed bridge across Big-Creek, lot 11, Con. 12, in the Township of Burford, will be received by the undersigned up to and including the **14th day of July, 1913.**

Plans and specifications may be seen at the home of Mr. Burtis (Deputy Reeve) Hatchley (on Tilsonburg Branch G. T. R.)

F. W. TAYLOR,
27-28 Township Clerk.

TENDERS
FOR
Concrete Conduit

Sealed proposals will be received at the offices of the Water Commissioner, City Hall, until 12 noon, July 15th, 1913, for the fabrication and laying of about 27½ miles of reinforced concrete pipe and appurtenances on the line of the Sooke Water Supply gravity conduit, and in accordance with the requirements of the general specifications prepared by Wynn Meredith, Consulting Engineer, for such construction, pursuant to the provisions of By-law No. 814, and adopted by the Council.

Plans and specifications can be seen, and forms of tender obtained, at the Sooke Water Supply Office, 1414 Douglas street, Victoria, B.C.

The lowest or any tender not necessarily accepted.

C. H. RUST,
Water Commissioner.
Victoria, B.C., June 14th, 1913. 26-28

To Contractors

Sealed tenders, marked "Tenders for Work," addressed to the undersigned, will be received at this Department until **Tuesday, July 15th**, for all work, excepting heating, plumbing and wiring required in the erection of a Court House and Registry Office at Haileybury; a Court House at Fort Frances; Poultry Building at the Ontario Agricultural College, Guelph; Dormitory Building at the Ontario Institution for the Blind, Brantford, and Dormitory Building at the Ontario Institute for the Deaf and Dumb, Belleville.

Plans and specifications can be seen at this Department and at the above named Institutions, and by applying to the Sheriffs at Haileybury and Fort Frances.

No tender will be considered unless accompanied by an accepted bank cheque, payable to the Honourable J. O. Reaume, Minister of Public Works, for 5 per cent. of the amount of tender, and the bona fide signatures and addresses of two sureties or the name of a Guarantee Company approved by this Department, willing to furnish bonds for the due fulfillment of the contract, must accompany each tender.

The Department is not bound to accept the lowest or any tender.

By order,

H. F. McNAUGHTEN,
Secretary, Public Works Department.
Department of Public Works, Ontario,
Toronto, June 30th, 1913.

Newspapers publishing this advertisement without authority, will not be paid for it. 27-28

Tenders For Bridge

Tenders will be received for the erection of a steel bridge 45 ft. c. to c., 14 ft. roadway, at Lot 26 Town Line Arron and Elderslie. Tenders received up till noon 22nd July, and opened at the site at 3 p.m. A cheque for $100 to accompany each tender. The lowest or any tender not necessarily accepted. Plans may be seen with James Warren, Engineer, at Walkerton, or the undersigned.

Signed, S. K. EUART.
Chesley, July 7th, 1913. 28-29

CITY OF REGINA, SASK.

TENDERS

Sealed tenders will be received by the City Commissioners at Regina, Sask., up until noon of **July 12th** for the supply of: Two vertical shaft, motor driven, centrifugal pumps to operate against 22 foot head, capacity 12,500 gallons per minute each.

Tender to be accompanied by a marked cheque for 5 per cent. (five per cent.) of the amount of tender.

Further particulars may be obtained from E. W. Bull, Superintendent of Light & Power Department, Regina, Sask. 25-28

Department of Railways and Canals, Canada

Beauharnois Canal

Protection Work for Valleyfield Government Dam

Notice to Contractors

Sealed tenders, addressed to the undersigned and marked "Tender for works for protecting the Government dam at Valleyfield," will be received at this office until 16 o'clock on Friday, **July 18th, 1913.**

Plans, specifications and form of contract to be entered into can be seen on or after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Superintending Engineer, Quebec Canals, Montreal, Que.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labour, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of $3,000 made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering decline entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES,
Asst. Deputy Minister and Secretary.
Department of Railways and Canals,
Ottawa, June 25th, 1913.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.—44229. 27-28

Notice to Contractors

Sealed proposals will be received at the offices of the Water Commissioner, City Hall, until 12 noon, **July 31st, 1913,** for the fabrication and laying of about 10¼ miles of 36-in. rivetted steel pipe and appurtenances on the line of the Sooke Water Supply pressure conduit, and in accordance with the requirements of the general specifications prepared by Wynn Meredith, Consulting Engineer for such construction, pursuant to the provisions of By-law No. 814.

Plans and specifications can be seen, and forms of tender obtained at the Sooke Water Supply Office, **1414 Douglas Street, Victoria, B.C.**

The lowest or any tender not necessarily accepted.

C. H. RUST,
Water Commissioner.
Victoria, B.C.,
June 27th, 1913. 28-29-30

Canadian Pacific Railway Company

North Toronto Grade Separation

Notice to Contractors

Sealed proposals will be received by the undersigned up to 12 o'clock noon on **Saturday, July 12,** for the construction of the substructure of a subway to be built at Yonge Street, at North Toronto.

Plans and specifications can be seen at the office of the Engineer of Grade Separation at No 262 Avenue Road, Toronto, where proposal forms can also be obtained.

B. RIPLEY,
Engineer of Grade Separation.
Toronto, June 26th, 1913. 27-28

Town of Carlyle, Saskatchewan

Waterworks and Electric Lighting

Sealed tenders, addressed to the undersigned, will be received up till 18 o'clock on **Friday, 1st August, 1913,** for the following contracts:—

1. Construction of brick power house and concrete reservoir, and laying approximately 800 lineal feet of pipe in trenches, and relative works.
2. Supply of Air-Lift Pumping System.
3. Supply of Duplex Steam Pump.
4. Supply and erection of two H. R. T. Boilers and Stack.
5. Supply and erection of compound vertical steam engine.
6. Supply and erection of Generator, Exciter and Switchboard.
7. Supply of Poles, arms, hardware, copper wire, transformers and meters.
8. Supply of Series Tungsten street lighting apparatus.
9. Erection of Pole Line.

Tenders must be accompanied by an accepted cheque for five per cent. of the amount of the tender, or alternatively by the bond of an approved guarantee company.

Plans and specifications and other information may be obtained at the office of the Consulting Engineers at Winnipeg and Calgary. A deposit of $25.00 will be required on Contract No. 1, which will be returned to bona fide tenderers on return of the plans.

The Corporation do not bind themselves to accept the lowest or any tender.

F. J. STENT,
Secretary-Treasurer,
Carlyle, Sask.
The John Galt Engineering Co., Ltd.,
Consulting Engineers. 28-29
28-29

Tenders for Bridge

Tenders will be received up to noon, **July 24th, 1913,** for the erection of a steel bridge 90 ft. c. to c. I. W. on lot 20 x 21, Con. III. S. P. R. **Bentinck.** Also for two concrete abutments for same. Plans and specifications may be seen with Henry Metcalf, Hanover, or James Warren, Engineer, Walkerton. A certified cheque for $200 to accompany each tender.

Signed, ALEX. WILSON,
Elmwood, Ont.
Bentinck, July 7, 1913. 28-29

Tenders Wanted

Sealed tenders, addressed to the undersigned, marked "Tenders for Automatic Street Flushing Machine," will be received up till 4 o'clock in the afternoon of the **29th day of July, 1913,** for supplying an Automatic Street Flushing Machine of at least 600 gals. capacity.

Tenderers must supply their own specifications and designs.

A marked cheque for $200 must accompany each tender, made payable to the order of the City Treasurer, which cheque will be subject to forfeiture in case of failure on the part of the successful tenderer to enter into a written agreement and bond with the City of Windsor with approved sureties when called upon to do so.

The lowest or any tender not necessarily accepted.

M. E. BRIAN.
City Engineer.
28-29

Tenders Wanted

Sealed tenders, addressed to the undersigned, marked "Tenders for Incinerator," will be received up till 4 o'clock in the afternoon of the **29th day of July, 1913,** for supplying all labor, tools, and machinery for the construction of an Incinerator of a capacity to dispose of at least 25 tons per day of garbage and refuse. Incinerator must also be capable of destroying all kinds of refuse, including night soil and dead animals.

Contractors must supply their own specifications and designs, including brick or reinforced concrete building.

A marked cheque for 10 per cent. of amount of tender must accompany each tender, made payable to the order of the City Treasurer, which cheque will be subject to forfeiture in case of failure on the part of the successful tenderer to enter into a written agreement and bond with the City of Windsor with approved sureties when called upon to do so.

Incinerator must be guaranteed for at least one year from date of operation.

The lowest or any tender not necessarily accepted.

M. E. BRIAN,
City Engineer..

Special Notice

Every man who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works are advertised.

Send along your plans when asking for tenders put a line in your advertisement to that effect.

No extra charge is made for filing plans at one or all four offices.

Contract Record and Engineering Review

Montreal—119 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—429 Pender Street.

Tenders for Dredging

Sealed tenders will be received at the Clerk's office, Chatham, Ont. (where plans and specifications can be seen) up to 12 o'clock noon, on **Thursday, July 31st, 1913**, for dredging about 9 miles of drainage work in the Township of Dover, County of Kent. The work to be let subject to the final passing of the By-law.

The lowest or any tender not necessarily accepted. Tenders must be marked "Tenders for Dredging," and each accompanied with a marked guarantee cheque for $2,000.

Dated, June 17th, 1913.

H. M. BEEHARD, Reeve.
JOHN WELSH, Clerk,
Chatham P. O.

26-30

TENDERS

Concrete Bridge at Saskatoon

Sealed tenders will be received up to 16.30 o'clock on **Tuesday, the 15th day of July, 1913,** for the under-mentioned work:—

Construction of a concrete bridge over the South Saskatchewan River at Saskatoon.

Tenders for this work must be accompanied by accepted cheque on a chartered bank, or other satisfactory deposit for the sum of $15,000. Deposits of unsuccessful tenderers will be returned when contracts are signed.

The right to reject any or all tenders, or to waive any defects or irregularities therein is to be at the discretion of the Chairman of the Highway Commission.

Plans, specifications, forms of tender and all information may be obtained on application to the undersigned.

A deposit of $50 must accompany each request for copy of plans and specifications; this amount will be refunded on the return of the plans.

The unauthorized insertion of this advertisement will not be paid for.

A. J. McPHERSON,
Chairman, Board of Highway Commissioners.
Regina, Saskatchewan.
June 20th, 1913.

26-28

BARGAINS!

1 Thew Steam Shovel, used less than 90 days, shop number 690; like new	$3,300
30 1½-yd. dump cars, 36-in. gauge; practically new. Each	30
1 American Well Air Compressor, 12 x 12 x 14, 340 ft. capacity, new	440
1 Rand Belted Air Compressor, 10 x 14; A.1.	240
1 Buckeye Trenching Machine, steam driven; cuts trench 27-in .wide to 8 ft. deep. Overhauled and A.1.	2,500
2 American, 6¼ x 10, D.C., D.D. Hoisting Engines with boilers and boom swingers, A.1. Each	725
1 Three-drum Stronsburg 7 x 10 Hoisting Engine with boiler; practically new.	725
1 Gates No. 5 Crusher, 2 arm Spider, rear drive (Rebuilt B.) Exceptionally low price.	

For anything else second-hand, write

WILLIS SHAW MACHINERY CO.

New York Life Building, Chicago, Ill.

Residences

(Continued from page 71)

L. Claffy, 70 Russell. Architect, J. P. McLaren, Sparks street. General contractor and mason, Thos. James, 140 Flora. Carpentry, McDermid & Tyndall, 243 Flora. 22 x 37 x 53, double brick construction.

Residence, cost $10,000, Clemow, for H. B. Borbridge, 539 Gilmour. Architect, W. Herbert George, Castle Bldg., Queen street. Mason, A. Tubbe, 72 Lees ave. Carpentry, Currie & Walsh. Heating and plumbing, J. T. Blythe, Bank street. Electrical, J. A. Ellacott, 226 Bank street.

Quebec, Que.

One pair residences, cost $12,000, for C. A. Vezina, Lockwell street. Architect and general contractor, Edm. Belanger, Lockwell street. Four storeys, 66 x 33, stone foundation, structural steel and brick construction. Excavating done.

Toronto, Ont.

Alterations to residence, cost $17,000, for J. B. O'Brien, 7 Thornwood avenue. Architect, H. F. Secord, King and Bay streets. Masonry and carpentry work being done by day labor by architect.

Residence, cost $5,000, St. Andrews Gardens. Builder and owner, T. U. Fairlie, 26 Adelaide street west. 2½ storeys, 24 x 36, brick construction.

One detached residence, cost $5,500. Builder and owner, H. F. Saunders, 35 Geoffrey street. Two storeys, 24 x 60, brick construction.

Three pair residences, cost $12,000, Langley. Builder and owner, Keyes & Seal, 12 Matilda street. 2½ storeys, 34 x 42, brick construction.

One detached residence, cost $5,000, Oakwood. Builders and owners, Shaw Bros., 501 Manning ave. 2½ storeys, 24 x 36, brick construction.

Windsor, Ont.

Residence, cost $7,500, Victoria, for James Pennington, 247 Sandwich street. Architects, Crane & Pennington, Boug Bldg. Mason, Robt. Parker. Carpentry, Wm. Hutchinson. Roofing, heating, plumbing and electrical work, Pennington & Brian. Two storeys, 31 x 32, brick construction and foundation.

Winnipeg, Man.

Two residences, cost $5,400, Glenwood Crescent, for A. Heilig, 129 Burrows ave. Architect and builder, owner. Two stys. 24 x 28, stone foundation, frame construction.

Three residences, cost $7,500, Martin, for Adelman & Safer, 592 Selkirk ave. Architect and builder, owner. Two stys., 24 x 26, stone foundation, frame construction.

Residence, cost $9,000, Waverley, for N. L. Leach, 607 McMillan ave. 2½ storeys, 30 x 43, cement foundation, frame construction.

Residences, cost $6,000 each, Spruce, for McCrae & McKenzie, 504 McIntyre Bldg. Architect and builder, owner. 2½ storeys and basement, stone foundation, pressed brick construction.

Residence, cost $4,500, Basswood Pl., for A. G. Davidson, 509 McIntyre Block, Main street. Architect and builder, owner. Two storeys, 23 x 30, stone foundation, frame construction.

Residence, cost $4,000, Strathcona, for J. Sangster, 60 Haldet street. Architect and builder, owner. Two storeys, 26 x 26, stone foundation, frame construction.

Residence, cost $3,500, Banantyne ave. for A. Matheson, East Kildonan Road. Architect and builder is owner. Two storeys, 22 x 26, stone foundation, frame construction.

Power Plants, Electricity and Telephones

Grand'Mere, Que.

Coffer dam and power house for Laurentide Co., Ltd., 71 Canada Life Bldg., Montreal. General contractor, H. F. Talbot, 907 McGill Bldg., Montreal. General contractor doing all work.

Grenfell, Sask.

Electric lighting plant, cost $15,000, planned by Town Council. Engineers, The British Canadian Engineering & Supply Co., Ltd., 122 Phoenix Bldg., Winnipeg, Man.

Montreal, Que.

Gas plant, cost $17,000, Cote St. Paul, for Montreal Light, Heat & Power Co., Craig street west or Harbour and Ontario. Builders, D. G. Loomis & Son, St. Patrick street. One storey, 105 x 68, concrete foundation, brick construction.

Morrisburg, Ont.

Hydro-electric Commission, Continental Life Bldg., Toronto, plan line 40 miles long to supply Morrisburg and district.

Russell, Man.

Electric lighting plant, cost $18,000. General contractor, S. D. Sparrow. 90 x 20, concrete foundation, brick construction.

Toronto, Ont.

Conduits for Toronto Hydro-electric System. Purchasing agent, C. W. Fatt, 226 Yonge street. General contractor, Claremont Sewer Pipe Co., 50 Church St., New York. Vitrified clay conduits.

Winnipeg, Man.

Extension of time. Tenders received by Board of Control, Secretary, M. Peterson, till August 1st, for one 1,000 kw. motor generator with accessories complete for King street sub-station. Specifications at office of Engineer, J. G. Glassco, 54 King street.

Business Notes

Montreal, Que.

Store and flats, Latour and St. Genevieve, owned by E. J. Savage, 121 Metcalfe street, Montreal, destroyed by fire. Loss $25,000.

Nairn Centre, Ont. (Algoma Dist.)

Store and hall of H. Lesser destroyed by fire. Loss $9,000; insurance $6,500.

St. Vincent de Paul, Que.

Residence of Arthur Desnoyers destroyed by fire. Loss $10,000.

Quebec, Que.

Factory of Canadian Packing Company, 4th street, Limoilou, burned. Manager, Theo Dion. Will rebuild at once, machinery required.

Miscellaneous

Amherst, N.S.

Tug, etc., for Dominion Government, Dept. of Marine & Fisheries. Minister, Alex. Johnston, Ottawa. A tug, dredge and two scows to be purchased. To remain at Amherst permanently.

Humberstone, Ont.
The Village Council contemplate purchasing new fire equipment. Clerk, J. J. Wichman.

Unclassified Items

Amherstburg, Ont.
Residence, cost $5,500, for E. P. Scratc. Architects, G. Jacques & Co., Windsor. General contractor, Jos. B. Wilson. Two storey, red pressed brick construction.

Berlin, Ont.
Factory, for Beck Duplicator Co., New York City. Sec.-Treas., H. M. Isaacs. Option secured on site.

Chaudiere Curve, Que.
Chaudiere Pulp & Lumber Co.'s plant destroyed by fire. Loss over $50,000. Will probably rebuild.

Cochrane, Ont.
Railway buildings for Commissioners of Transcontinental Railway. Sec., P. E. Ryan, Ottawa. Tenders received until noon July 22nd for ice house, storehouse, freight shed and 2 tool houses. Plans at office of Gordon Grant, chief engineer, Ottawa, and T. S. Armstrong, Dist. Engineer, Cochrane.

Espanola, Ont.
25 workmen's houses, for Spanish River Pulp & Paper Co., Espanola and Sturgeon Falls. Company will build above for their employees and an addition to their 3-storey hotel is also contemplated.

Hamilton, Ont.
Alterations to hotel, cost $8,000, for Geo. Goldbery, Pioneer Hotel, King and Caroline. General contractors, Mitchell & Riddell, 89 Sherman ave north.

Apartment house, cost $18,000, Sherman Ave. S., for P. G. Colvin. General contractors, Sparks & McKay, 133 Cannon street east.

London, Ont.
Residence, cost $6,000, Wellington. Builder and owner, L. E. Carrothers, 435½ Richmond St., c/o J. M. Moore. Two storeys, red pressed brick construction.

La Salette, Ont.
Church, cost $40,000, for the R. C. congregation of La Salette, Ont. General contractor, Ben Blonde, La Salette, Ont.

Montreal, Que.
Alterations to Windsor station entrance, Windsor street, for C. P. R. Architect, C. P. R. Engineering Office. General contractors, Geo. A. Fuller Co., Ltd., 210 Read Bldg. Stone construction.

Four flats, cost $7,000, Marlowe. Builder and owner, Fred Demers, 288 Marlowe Ave. Two storeys, 50 x 38, cement foundation, brick construction.

Double tracking for Intercolonial Railway. Manager, F. P. Gutelius, Montreal. Company intend to double track road from Halifax to Montreal. A six-tenth grade is contemplated which may necessitate a change of route in several localities.

Flats, cost $10,000, Maisonneuve (Orleans), for Mrs. M. Limonges, 77 Orleans. Builder, Roch Limoges, 66 Orlean. Three storeys, 30 x 53, brick construction.

Six flats, cost $16,000, Outremont (Hutchison), for H. Fortier, 2473 Hutchison St. Builder and architect, Owner. Brick, Come Frenette, 1354 St. Denis. Stone, Ros Frenette, c/o Owner. Other contracts will be awarded about July 11th. Three storeys, 50 x 74.

Eight flats, cost $7,000, Poupart. Builder and owner, J. P. A. Belanger, 2109 Poupart. Brick, Mr. Iron, c/o Owner. Heating and plumbing, J. E. Belleau, 226a Bourbonniere. Three storeys, 50 x 38, brick construction.

Ottawa, Ont.
Pavements, cost $40,000, for city council. Mayor, J. A. Ellis. City engineer, Archibald Currie. Tenders will be called in about 2 weeks. Asphalt pavements on Spadina, Dalhousie and Clarence.

Factory, cost $35,000, for the Crown Lithographing Company, Limited, Nelson street. Two storeys, 175 ft. x 60 ft. Architects, Dore & Coyles; bulk contractors, Toms & Copeland; plumbing and heating, M. M. O'Connell.

Province of Ontario
G. T. Rly Co. has been authorized to reconstruct bridge No. 99 over public road between Lots 16 and 17 in Con 3, Twp. Ray at Mile Post 161.10, 9th Dist. 2.90 miles east of Midland.

Province of Quebec
Bridge cost $3,000, over River des Chutes, for Municipal Council for St. Narcisse. Mayor, Treffle Barril. Plans, etc., at office of Sec.-Treas., Alfred Trudel. One span, 30 x 16, concrete, steel, 5 18 in. I beams, 55 lbs., 34 ft. long and 4 in. red pine.

Port Colborne, Ont.
Robinson Cork Co.'s factory destroyed by fire. Main building destroyed, will likely rebuild this summer.

St. Marys, Ont.
Two residences, cost $6,000. Builder and owner, Jas. McCardle, Peel Street. White brick and cut stone construction.

Thorold, Ont.
Factory, cost $400,000, for Coniagas Reduction Co., Ltd. Manager, J. J Mackan, Bank of Nova Scotia Bldg., St. Catharines. Motors and generators, tanks, stacks, cranes required.

Euthilda, Sask.
Station for G. T. P. Branch Line Co. Company's revised location of sation at Euthilda in Sec. 3-34-18, W 3 M has been approved.

Westboro, Ont.
Bank, cost $10,000, for Bank of Ottawa, Wellington street, Ottawa. Solid brick construction. Plans ready.

Windsor, Ont.
Store and flats, cost $10,000, Pitt & McDougal, for Herman Benstein. Architect, G. Jacques & Co. Two storeys, 45 x 88, brick construction. Plans ready.

Alterations to store, Sandwich street, for Lyons Tailoring Co. Architects, G. Jacques & Co. Plans in progress.

Factory, cost $10,000, Factory Dist., for Swedish Crucible Steel Co. President Nelson L. Olson, Detroit, Mich. One and two storeys, 100 x 45, 100 x 125, structural steel and reinforced concrete construction. No contracts let.

Weyburn, Sask.
Pipe laying, etc., for C. P. R. Tenders received by District Engineer, J. G. Martin, Moose Jaw, until July 12th for trenching, pipe laying and back filling, 10-in. wooden pipe line 3.3/10 miles long. Plans at office of J. G. Sullivan, Chief Engineer, Winnipeg, W. T. Daniels, Res. Engineer, Regina, and J. V. McNab, Res. Engineer, Saskatoon.

New Companies

Germanite Limited, incorporated with a capital of $100,000, to carry on business as manufacturers of bricks, tiles, terra cotta, etc., with head office at Toronto. The provisional directors are E. G. Law, Howard Scott, contractors, and Edward Gillis, solicitor, all of Toronto.

The Sault Ste. Marie Land Company, Limited, has been incorporated with a capital of $50,000, to carry on business as a general land and building company, with head office at Sault Ste. Marie. The provisional directors are J. A. McPhail, barrister, T. T. Barnes, druggist, and Dr. G. W. Bald, all of Sault Ste. Marie.

The Toronto-Berlin Land Company, Limited, has been incorporated with a capital of $40,000, to carry on business as a land and building company, with head office at Toronto. The provisional directors are R. B. Haley, broker, R. T. Irvine, and G. W. Eversfield, salesman, of Toronto.

Gloucester Realty Company, Limited, has been incorporated with a capital of $50,000, to carry on business as a general land and building company, with head office at Toronto. The provisional directors are J. H. T. Nesbett, J. J. Flint, bookkeepers, and G. D. Waters, cashier, all of Toronto.

Volt Electric Company, Limited, has been incorporated with a capital of $40,000, to manufacture and deal in electrical appliances and devices, etc., with head office at Toronto. The provisional directors are D. F. Pierce, manager, J. J. Kenney, sales manager, and J. E Anderson, law student, all of Toronto.

The Kildonan Land and Development Company, Limited, has been incorporated with a capital of $150,000, to carry on business as a land and building company, with head office at Winnipeg. The incorporators include J. R. Frizzell, barrister, A. H. Farries, real estate agent, and D. M. Telford, custom house appraiser, all of Winnipeg.

Williamson Construction Company, Limited, has been incorporated with a capital of $100,000, to carry on business as general contractors and dealers in builders supplies, with head office at Walkerville. The provisional directors are Victor Williamson, contractor, C. V. Williamson, architect, and C. K. Hall, millman, all of Walkerville.

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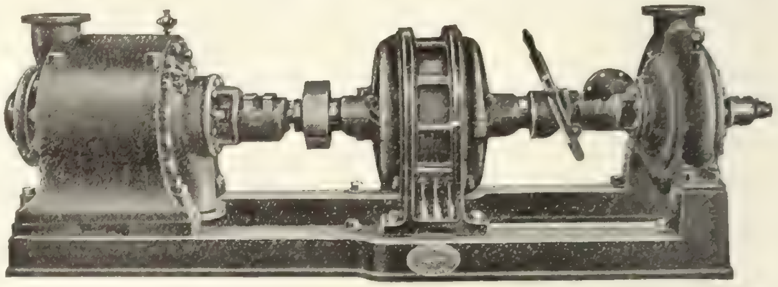

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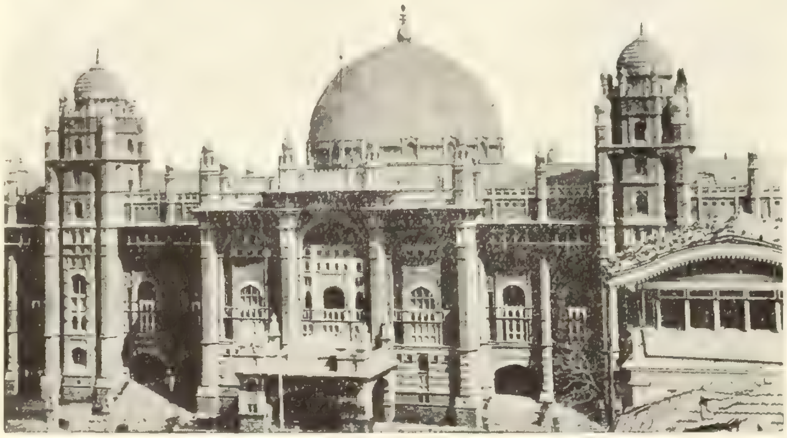

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THE SILVER BAY ASSOCIATION
New York, Nov. 27, 1912

Ceresit Waterproofing Co., Chicago
My dear Sir—

Regarding the Ceresit which we purchased from you last spring.

The water supply for the Silver Bay Property is pumped from a Mountain Lake to a reservoir 50x100 with a capacity of 11,000 barrels. After the reservoir had been in use for a little time, leaks were discovered which we were unable to check. Last spring Ceresit was used and while the reservoir was used all summer no leaks appeared. We are fully convinced that Ceresit is the proper waterproofing.

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Ceresit is sold all over the world in barrels, and five and ten gallon jacketed cans labeled with our name for identification. CERESIT is catalogued in "Sweet's" Index. Agents wanted in unoccupied territory.

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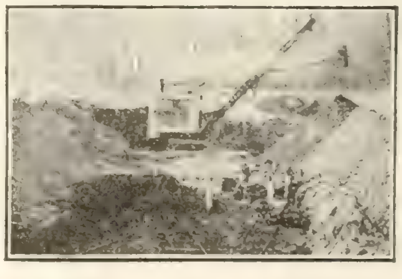

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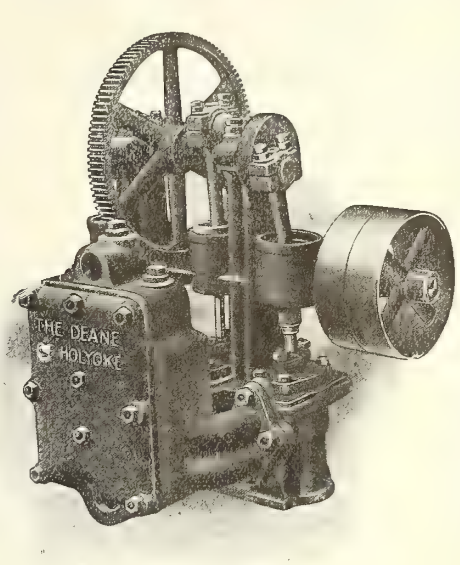

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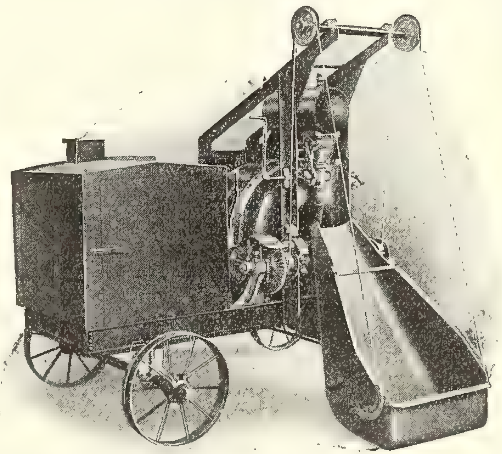
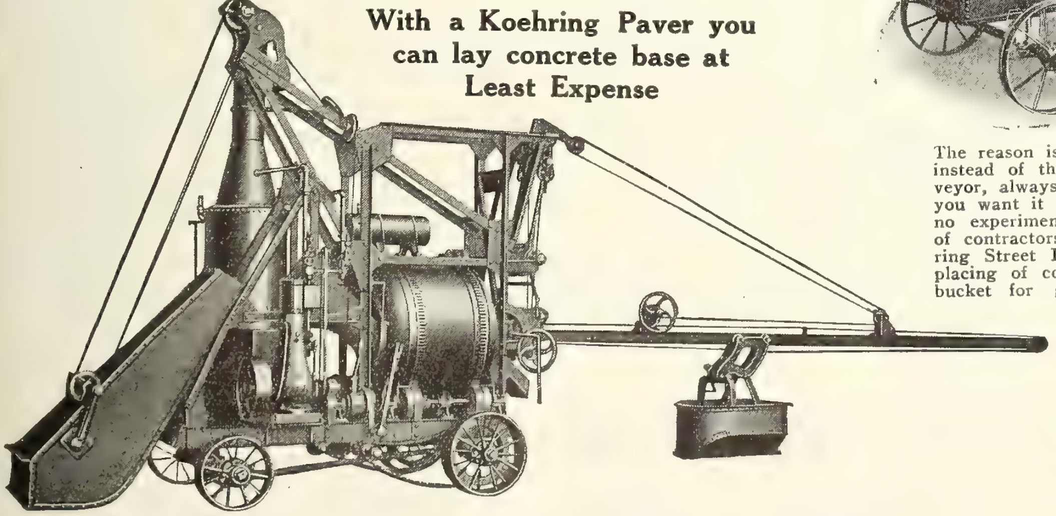
The Koehring 3 in 1 principle of mixing means three times as much mixing or an equal amount of mixing in one-third of the time. There are three independent and opposed mixing actions in the Koehring drum producing thoroughness of mixing and rapidity of mixing and a uniformity of mixing, no other Mixer equals. There are also equally important advantages in the mechanical construction of the Koehring Mixer.

The heavy cast special metal Koehring drum will outlast the drum of any other Mixer. The railroad truck bearing truss and the rollers being keyed on to the axle, makes "wabbly" drums impossible.

The charging bucket raises to a nearly vertical position so that all the material will pass into the drum without pounding the bucket. There are numerous other important features in the Koehring Mixer that you should know about.



With a Koehring Paver you can lay concrete base at Least Expense



The reason is the machine conveys the concrete instead of the men, and it's a dependable conveyor, always places the concrete exactly where you want it and always dumps clean. There is no experiment about it, the records of dozens of contractors prove the economy of the Koehring Street Paving Mixer and it combines this placing of concrete with a simple charging bucket for getting material into the drum in shortest possible time and least number of men, also, it has traction drive for moving the machine along the line of work and keeping close to the material pile. This builds contractors' reputations and pays handsome profits. Aren't you interested in this reputation and profit making?

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has all the stability of the lake asphalt, of which it is a primary form, that in the course of centuries becomes the more solid asphalt of the lake's surface.

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Trinidad Liquid Asphalt is a permanent constructive agent; it is not merely a temporary dust layer.

Made in two grades: Trinidad Liquid Asphalt A—for use cold. Not only prevents dust, but forms a waterproof surface for macadam and dirt roads.

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There is an illustrated booklet which tells the whole story of Trinidad Liquid Asphalt in a few plain words. Send for it.

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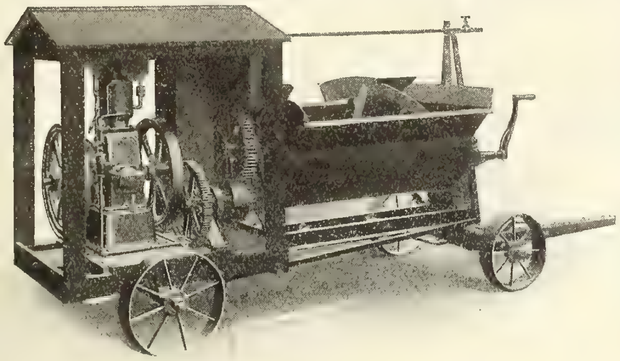
One Mixer for all Work



The Blystone Mounted Mixer with Power

You will do your concrete mixing quicker and cheaper with the Blystone Mixer. This is not what we alone say but what all users say. This mixer is adaptable to all kinds of work. We are willing to prove its advantages to you—give us the opportunity.

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1—No. 2 Milwaukee Concrete Mixer, (New.)
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The above machines are but slightly used and are in good working order.

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After supervising the construction of four miles of concrete walk, curb and gutter with Hotchkiss Lock Steel Forms at St. Lambert, Province of Quebec, Canada, A. S. Dickison, member of the Canadian Society of Civil Engineers, writes:

"In my humble opinion it is the only proper way to lay sidewalks. Ours have been down through a Canadian winter and there was not a heave in four miles of it."

This shows part of the four miles of sidewalk, curb and gutter combined at St. Lambert, Quebec, with Hotchkiss Lock Steel Forms

Hotchkiss Steel Lock Forms

reduce labor costs and entirely eliminate the lumber problem.

The amount you spend in one season for lumber for wooden forms will buy an outfit of Hotchkiss Lock Steel Forms that will last many seasons and give service over and over on a variety of work, such as sidewalk, pavement, wall and curb and gutter construction. So much for the economy of our forms.

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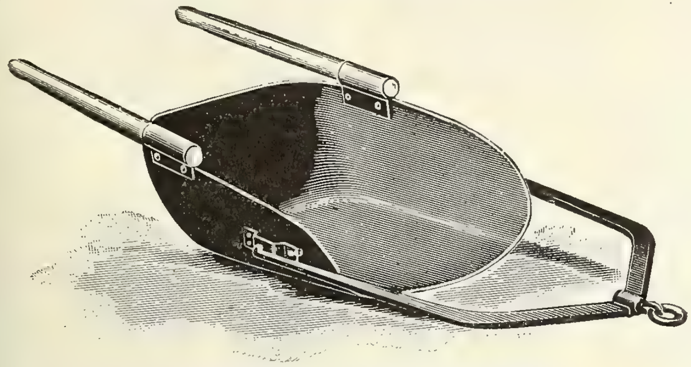
Curb and gutter and walk can be constructed in one operation with our forms, as shown in illustration of work at St. Lambert, Canada.

In addition to the many advantages of Hotchkiss Lock Steel Forms we give you the advantage of a special demonstration offer. You can try our forms on your own work at our risk. Write today.

Hotchkiss Lock Metal Form Co. 17 Hamilton Street Binghamton, N.Y.



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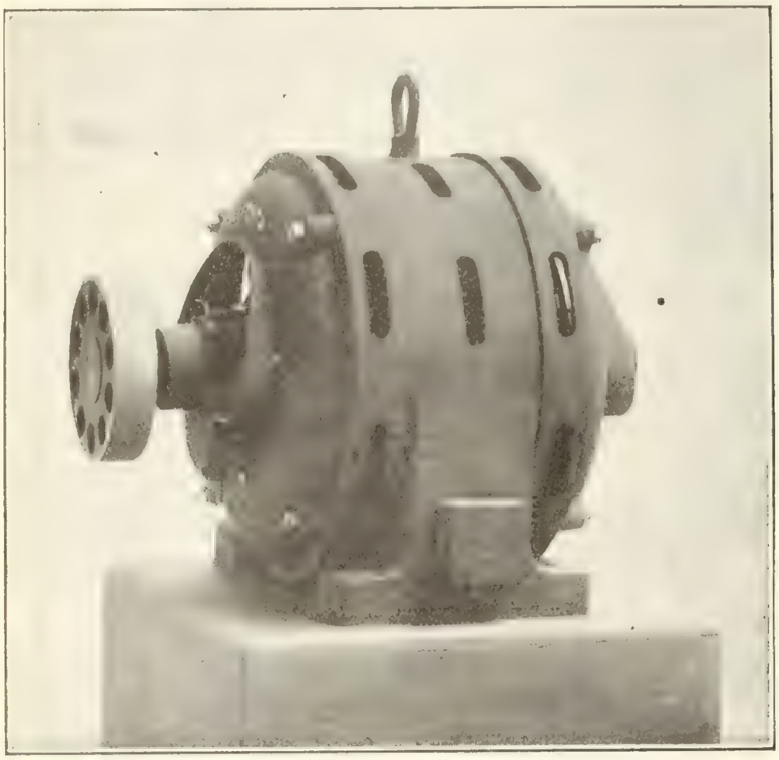

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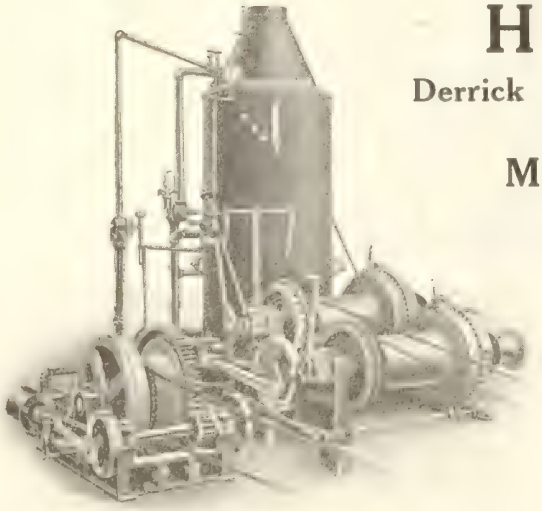

The above Engine and Steam Derrick Swingers are kept in stock at our Winnipeg Plant. Early deliveries can also be made direct from our works at Goderich

This half tone illustrates our Hoisting Engine in combination with our independent Steam Derrick reversible Swinging Engines. The advantages of an independent Swinger are, increased power of the main hoisting engine, increased swinging power, easier to operate and control, while the division of weight into two machines facilitates change of position more readily and permits the engine being placed closer to the derrick where limited for space.

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Here's the latest addition to the WONDER line of Concrete Mixers. This Side Loader practically doubles the capacity of the LITTLE WONDER "FIVE" and the WONDER "TEN." The neck of the bucket is wide. Materials slide easily and rapidly into the drum without poking or pounding. When elevated, bucket is in almost vertical position and does not hinder moving about. Frame is light, scientifically braced and very strong. Control levers grouped so one man loads the drum, tilts and dumps it and attends to engine.

The LITTLE WONDER "FIVE" has capacity of five cu. ft. per batch and turns out 35 to 50 cu. yds. per day without Side Loader. It is famous all over the world as the original small Tilting Drum Batch Mixer. You ought to have it, with or without Side Loader, according to your need. Our "Man to Man" proposition, which includes

Absolutely Free Trial

and easy payments, makes it almost a crime for any man who does concrete work and wants to make money, to be without it. This new combination gives you at low cost a mixer that will do any job that offers, yet is the swiftest and most economical machine for the smallest work. Once you know its simplicity, strength and speed you will not hesitate. It doesn't cost you a cent to find out, because we even pay the freight if you are not satisfied in every particular. Write for our "Man to Man" Proposition.

Canadian Representatives Wanted

Waterloo Cement Mach'y. Corp'n.

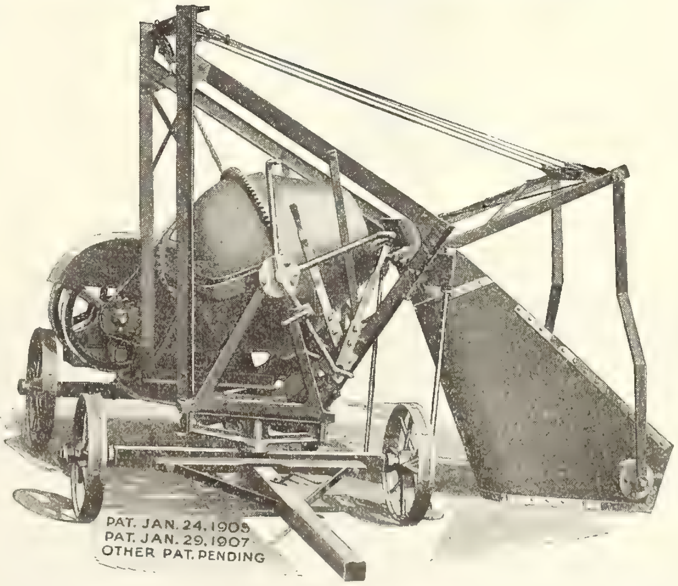
117 Vinton Street, Waterloo, Iowa

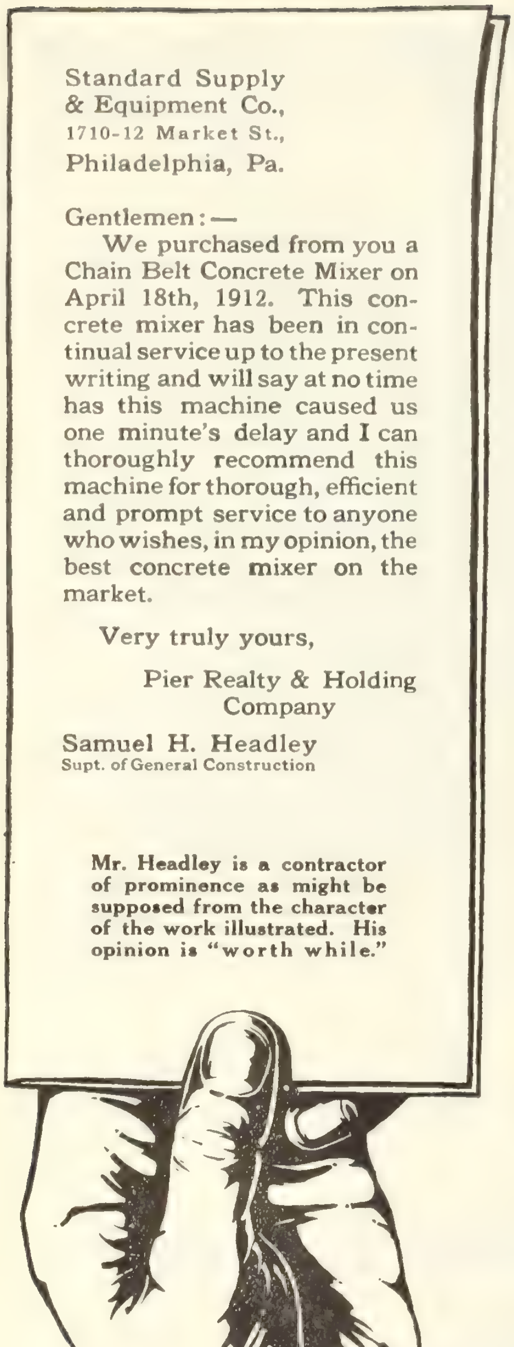
Look at the

Little Wonder "Five"

with the NEW

Side Loader





Standard Supply
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Gentlemen: —
We purchased from you a Chain Belt Concrete Mixer on April 18th, 1912. This concrete mixer has been in continual service up to the present writing and will say at no time has this machine caused us one minute's delay and I can thoroughly recommend this machine for thorough, efficient and prompt service to anyone who wishes, in my opinion, the best concrete mixer on the market.

Very truly yours,

Pier Realty & Holding Company

Samuel H. Headley
Supt. of General Construction

Mr. Headley is a contractor of prominence as might be supposed from the character of the work illustrated. His opinion is "worth while."

The Builder of the $500,000 Concrete Pier at Atlantic City Considers the

Chain Belt Mixer

"THE MIXER WITH THE BULGE."

The Best Concrete Mixer on the Market

THE mixer was placed in service on the pier project and how well it did the work is shown by the foregoing testimonial.

Work of this character is pretty good evidence of the capacity and efficiency of a concrete mixer. The pier in question extends more than a third of a mile out to sea. The construction, therefore, must be of the most substantial kind. The concrete must be of high grade and of uniform quality. The Chain Belt Mixer was the mixer selected to produce it.

The work must be rapid. The Chain Belt Mixer is one of the lighest-running and fastest machines built. It therefore met that requirement.

There must be no interruptions due to breakdowns, etc. Chain Belt Drive and the Chain Belt Mixer constructions generally are the best possible assurance against breakdowns and loss of time. Hence, the Chain Belt selection on those grounds.

The season will be in full swing almost before you know it. Better order that Chain Belt Mixer now. What size do you require?

CHAIN BELT COMPANY

MILWAUKEE, WISCONSIN

Dominion Equipment & Supply Company,
Winnipeg, Manitoba, and Vancouver, B. C.

Atlantic City Pier in Course of Construction. Completed, it will have cost $500,000. It will extend 2,000 feet seaward and is being constructed almost entirely of reinforced concrete. Samuel H. Headley, Contractor. Chain Belt Mixer used.

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Timber Preservers and Fireproofers

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Sole owners of the B. M. patent process of lumber preserving.

British Method **Best Method**

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Water, Salt, Oil and Gas Wells drilled to any depth up to 5,000 feet, any diameter.
Tests made for foundations. Contracts taken in any part of Canada. Excellent references. Estimates furnished.

Our forty years of experience is a guarantee of satisfaction. Artesian Wells drilled by us are supplying pure, clear water to many towns and villages in Canada.

James Peat & Sons, Limited, Petrolea, Ont.

McKiernan-Terry Core Drills

- Rock Drills
- Hammer Drills
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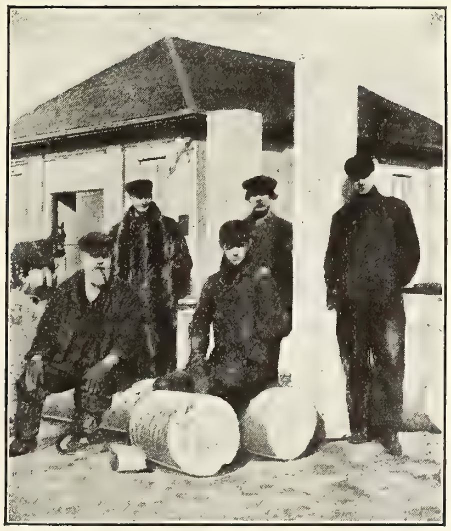
- Pile Hammers



- Ore Crushers
- Atlas Ball Bearing Jacks
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The 16 in. hard limestone cores shown above were taken out by one of our Type "C" McKiernan-Terry core drills, operated by the Corporation of Winnipeg.
This Drill is capable of boring any size holes up to 30 ins. in diameter.

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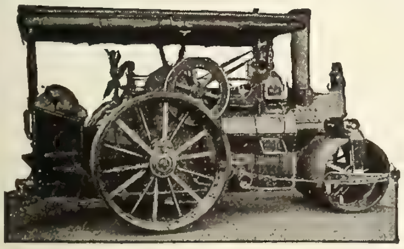

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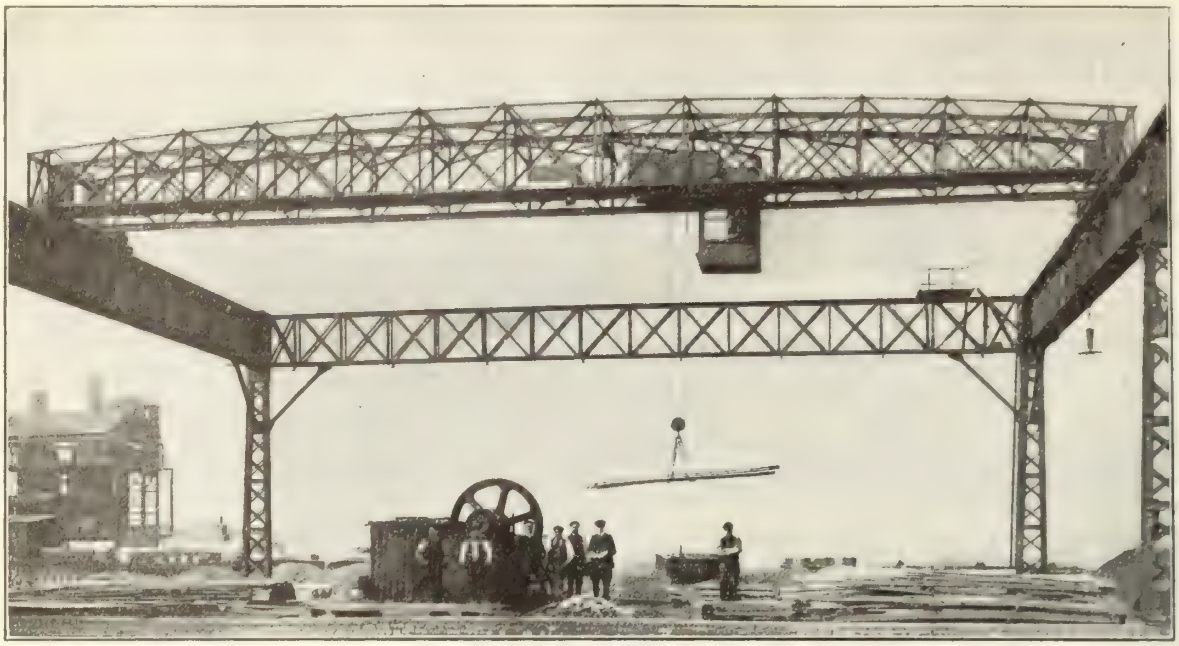

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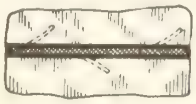
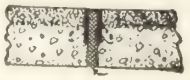


Longitudinal Section Showing Joint.



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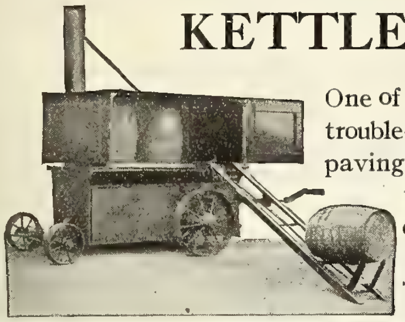

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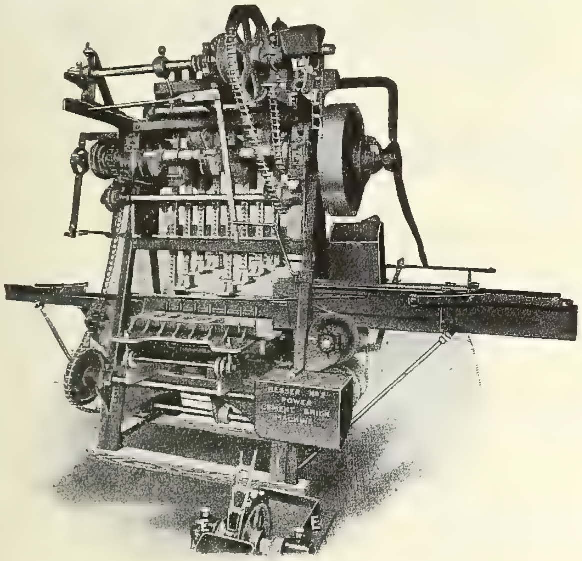

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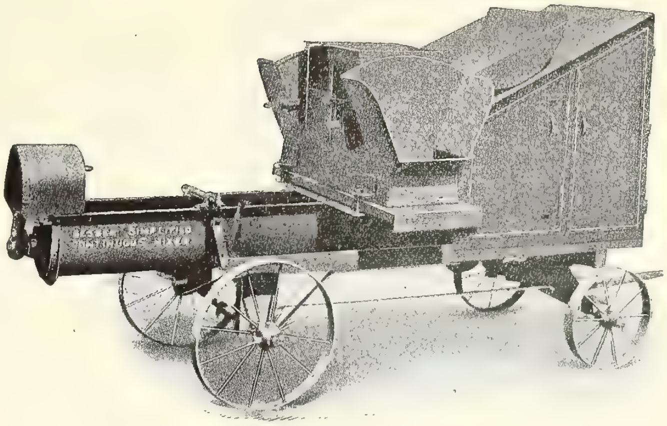

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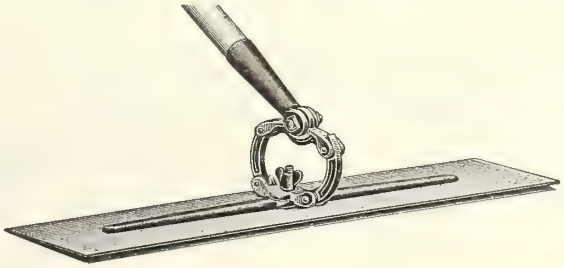

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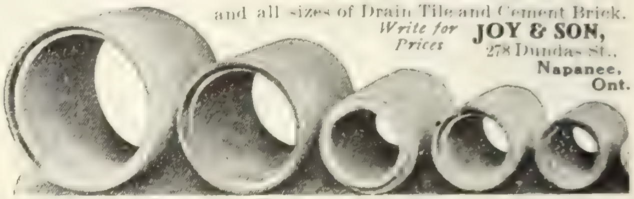

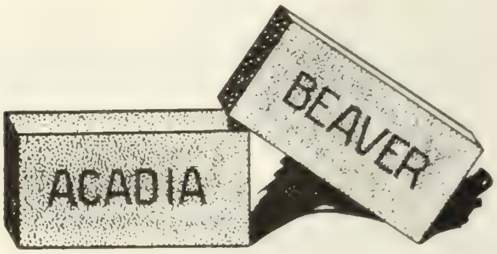

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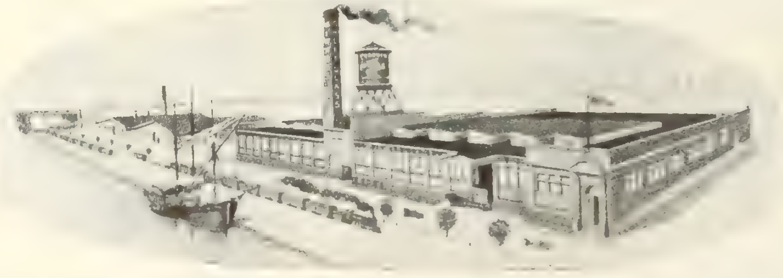

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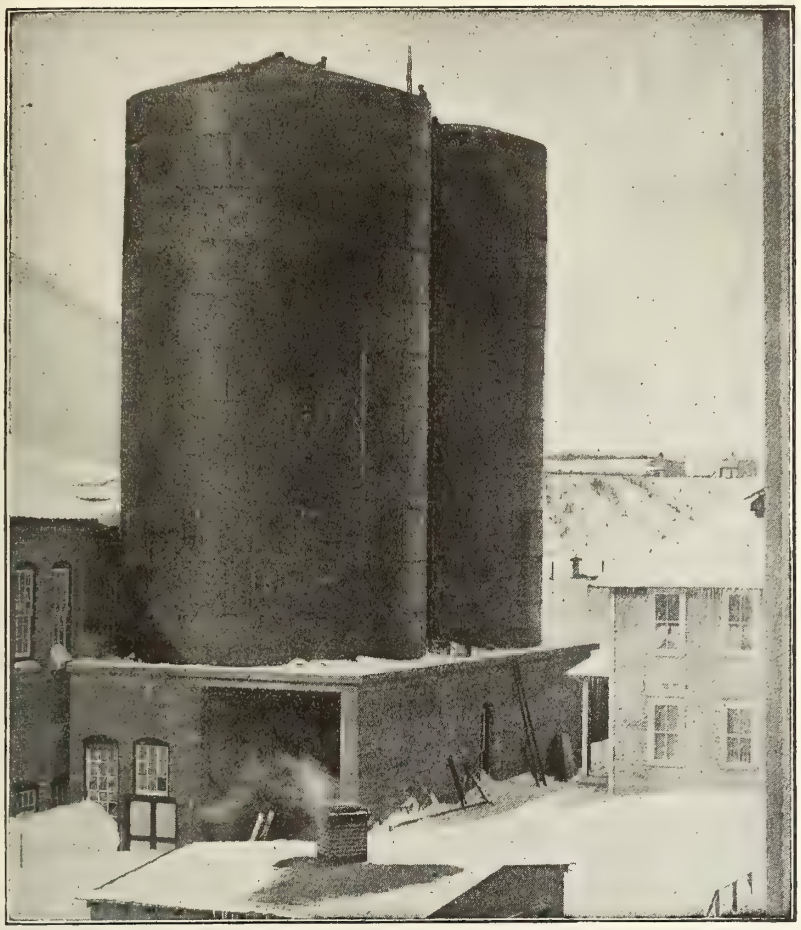

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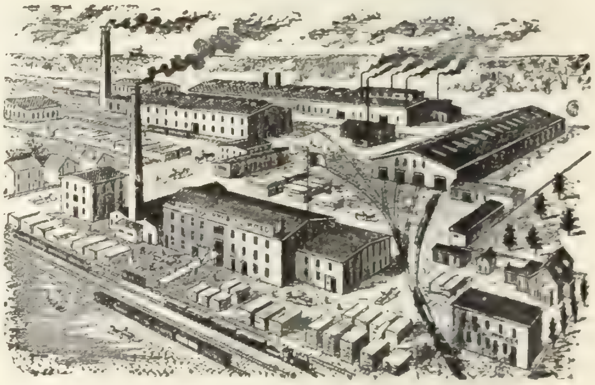

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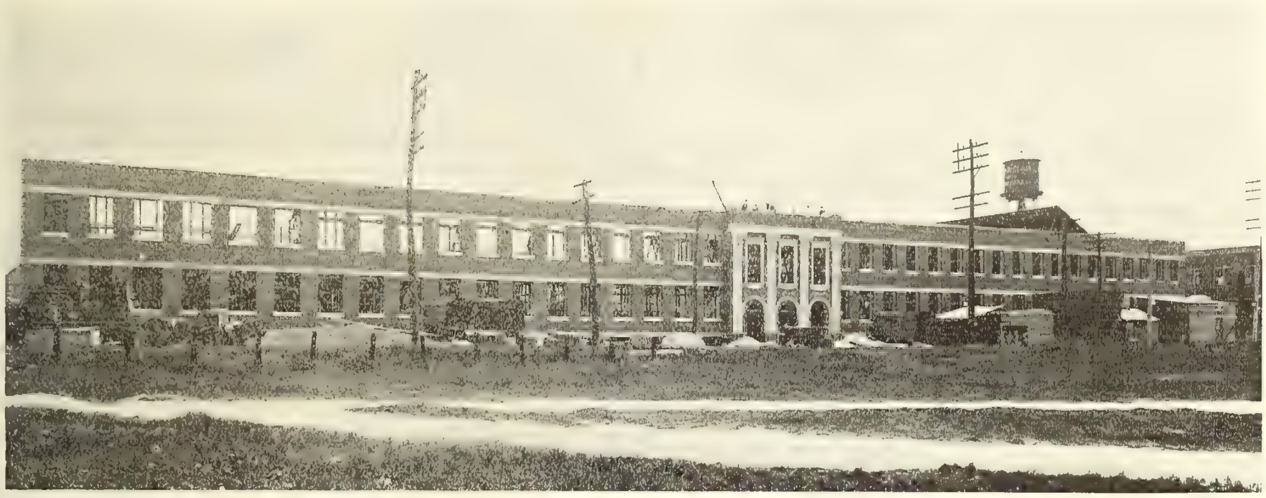

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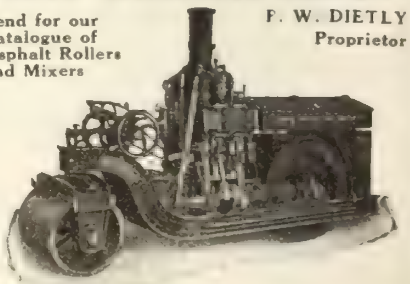

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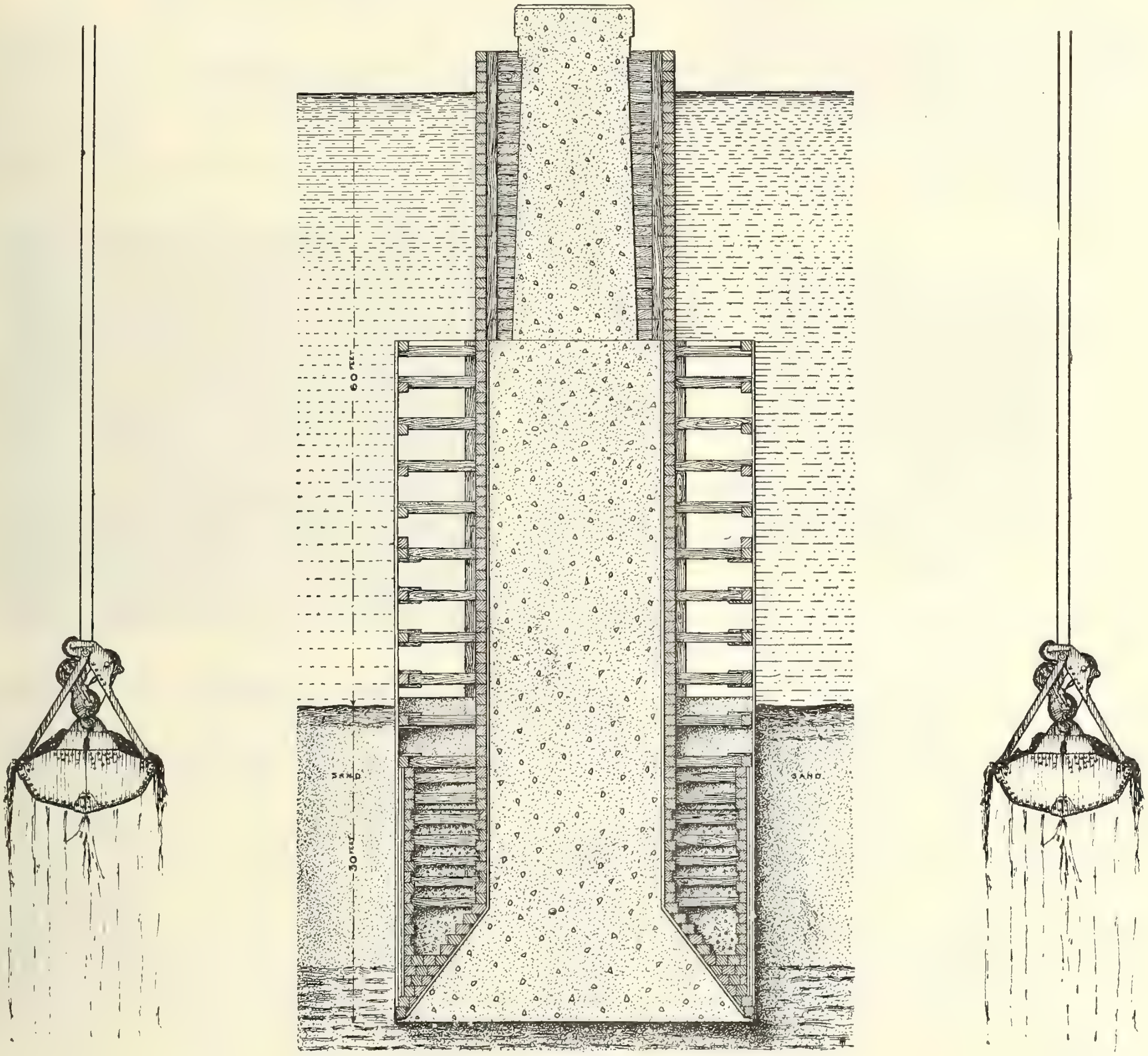

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THE Underwood embodies in one machine all that can be expected in a typewriter. It is sold at the price which should be paid for a machine of its quality.

United Typewriter Co., Ltd.
All Canadian Cities

Dominion Marble Company
Limited
Montreal, Que.

SOLE producers of the Beautiful Royal Dominion marble quarried at South Stukely, Que. A card or 'phone call will bring our representative to submit figures on any class of marble work. Address all letters to the Company P.O. Box 1166, Montreal.

NOTICE TO OUR CUSTOMERS

¶ Please take note that our mills and Head Office are now located in Lyster, Megantic Co. where all correspondence should be addressed, and orders as in the past will be attended to promptly.

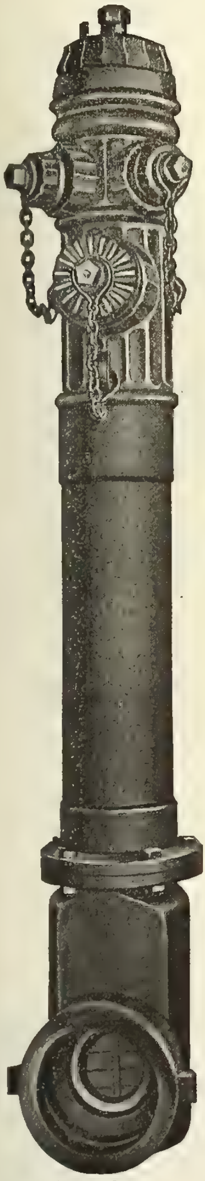
Lyster Wood Box Turning Enamelling Company, Limited
LYSTER
Successors to Automatic Wood Box & Turning Co., St. Romuald, Que.

We Manufacture

The Reliable Line of

VALVES

- Brass Globe and Gate.
- Steam and Hot Water.
- Packless Radiator.
- Iron Body "Keystone" Gate, (non-rising stem or outside screw and yoke, with screwed, flanged or hub end)
- Iron Body Swing Check.



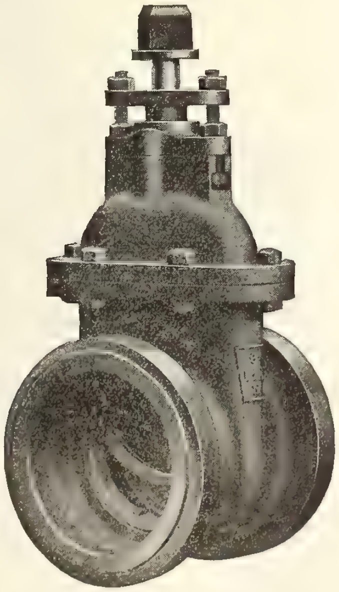
Kerr Gate Hydrant.

Gate and Compression FIRE HYDRANTS

INDICATOR POSTS

CRANES FOR FILLING WATER CARTS

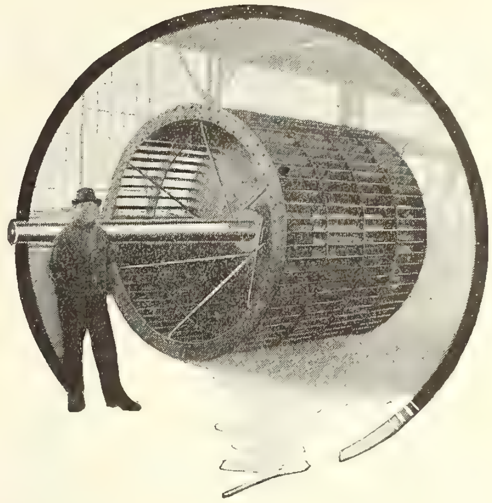
VALVE BOXES
Screw Adjustable or Slide Adjustable



6″ Hub End Gate

Forty Years of Experience has much to do with the satisfaction these goods give our customers.

THE KERR ENGINE CO.
LIMITED
WALKERVILLE, ONT.



Fresh Air for 9,000 People Delivered by ONE

"Sirocco"

TRADE MARK.

Ventilating Fan

The illustration shows a double inlet "Sirocco" Fan with a capacity of 270,000 cubic feet of air every 60 seconds at 5″ water gauge.

A "Sirocco" Fan will deliver twice as much air as the ordinary steel plate fan of the same wheel diameter. Save one-half the space and one-third the power.

"Sirocco" Fans and Blowers are made in sizes to deliver from 75 cubic feet per minute to 1,000,000 cubic feet per minute.

Our Engineering Department will gladly co-operate with you in the selection of the proper equipment for YOUR needs.

Let us tender on your next requirements. Bulletin No. 3401 is descriptive of the construction and operation of "Sirocco" Fans. You should have a copy.

CANADIAN Sirocco COMPANY
LIMITED
WINDSOR, ONTARIO.

Engineering Salesmen
CLARK T. MORSE, 301 McGill Bldg., Montreal
E. C. POWERS, Room 5, 43 Victoria St., Toronto
W. P. EDDY, 214 Donald St., Winnipeg

Current Prices of Building Material.

BRICKS

The following are wholesale prices delivered at Toronto:—

	Per M
No. 1 dry pressed red brick	$18 00
No. 1 dry pressed buff brick	18 00
Red Stock Bricks	13 00
Grey Stock Bricks	13 00
Wire cut bricks for foundation work ...	12 50
Porous terra cotta bricks	15 00
No. 1 enamelled bricks, all colors, from	$80 00 to $150 00

LUMBER (Building Material)

Hemlock Lumber -

2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$27 00	
2 x 4 to 2 x 12, 16 ft.	27 00	
2 x 4 to 2 x 12, 18 ft.	26 00	30 00
1 in. Hemlock, No. 1	26 00	28 00
No. 1 Hemlock Decking	24 00	28 00
No. 2 Hemlock dimension and 1-in.	20 00	22 00

Pine—

1 in. common pine 8 to 12 in. wide rough	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
⅞ x 8 and 10 in. pine shelving..	36 00	42 00
⅞ x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine desking D2S	30 00	
Spruce Decking	28 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

Pine trim for paint finish—

4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8-in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

Shingles -

XXX B. C. Clear Shingles per M.	3 90
N. B. Extras	3 75
N. B. Clears	3 10
No. 1 pine lath, per M.	5 00
No. 2 pine lath	4 50
No. 1 spruce lath	4 00

Cedar Posts—Fence—

5 in. at small end, each	30
7 in. at small end, each	35
Hemlock lath	3 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

	Star	D.D.
10 to 25 united inches	$4 25	$ 6 25
26 to 40 "	4 60	6 75
41 to 50 "	5 10	7 50
51 to 60 "	5 35	8 50
61 to 70 "	5 75	9 75
71 to 80 "	6 25	11 00
81 to 85 "	7 00	12 50
86 to 90 "		15 00
91 to 95 "		17 50
96 to 100 "		20 50
101 to 105 "		24 00
106 to 110 "		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for box lots:—

MONTREAL

	Star	D.D.
25	$3 25	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
90		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 u.i.	$3 50	$5 00
26/40	3 75	5 50
41/50	4 25	6 25
51/60	4 75	7 00
61/70		8 00
71/80		9 00
81/85		10 00
86/90		11 00
91/95		13 00
96/100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

STEAM FITTERS' AND PLUMBERS' SUPPLIES

Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock ...... net $1.85

No. 4½ Fuller's .... net $2.50

Square head brass cocks, 65 per cent.

Lead Pipe

Lead pipe, $7.50, less 10 per cent.; lead waste, $9.00, less 10 per cent.; caulking lead, 6¾ cents per lb.; traps and bends, 35 per cent.; pig lead, 5¾ cents per lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.28	¼ inch	$3.18
⅜ "	2.28	⅜ "	3.18
½ "	2.72	½ "	3.57
¾ "	3.28	¾ "	4.43
1 "	4.85	1 "	6.55
1¼ "	6.56	1¼ "	8.86
1½ "	7.84	1½ "	10.59
2 "	10.55	2 "	14.25
2½ "	16.67	2½ "	22.52
3 "	21.80	3 "	29.45

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

Soil Pipe and Fittings

Medium and extra heavy pipe and fittings, up to 6-inch, 60 and 5 per cent.

7 and 8-inch pipe, 45 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

CEMENT, STONE, STEEL, Etc.

Cement, barrel lots, in bags, delivered Toronto, bags extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ⅜-inch, $1.45.

Burnt River rubble stone delivered, $17 to $18 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¾ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

Free stone delivered, $17 to $18 per toise.

Brown coursing stone, delivered, $3.75 per yard.

Grey coursing stone, delivered, $2.50 to $2.75 per yard.

Sand, for cement or brick work, $1.15 a cubic yard, f.o.b. Toronto, C. P. R. sidings.

Sand, for cement or brick work, 90c to $1.05 a cubic yard, f.o.b. Toronto, G. T. R. sidings.

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

Steel channels and beams, $2.65 to $3.00 per 100 pounds, delivered f.o.b. Toronto.

Hard Wall Plaster, unsanded, from $7.00 to $8.50, bags extra; sanded, $4.50 in car lots; hydrated lime, $9.00 in car lots.

Lime per cwt., delivered, not less than 1,500 lbs. 33 cents; white, 43 cents.

Plaster of Paris, Anchor and Crown Brands, $1.50.

Manilla Rope, best, per pound, 12½ cents.

PAINT AND OILS

Pure White Lead, ground in oil, $8.50 per 100 lbs.

Boiled Linseed Oil in bbls., 63c. per gal. of 9 lbs.

Raw Linseed Oil, in bbls., 60c. per gal. of 9 lbs.

Turpentine, in barrels, 60c. per gallon.

Pure Red Lead, dry $6.50 to $7.50 per 100 lbs.

Putty, pure linseed oil, in bulk, bbls. 3½c.

Putty, pure linseed oil, in 25-lb. tins, 4c.

Gravity System Distributing Concrete

Gravity System Equipment on Large Concrete Building

A system that improves the concrete and reduces the cost.

Information gladly furnished and estimates given on any work.

Canadian Concrete Appliance Co., Ltd.

Sole Licencees for Canada

613 Vancouver Block,
VANCOUVER
B. C.

Eastern Representatives
Stinson Reeb Builders' Supply Co., Ltd.
Montreal, P. Q.

Wooden Water Pipe

Galvanized Wire Wound and Continuous Stave Pipe for Water Works, Power, Irrigation, etc.

Withstands 250 lb. working pressure.

Not affected by Frost, Corrosion, Electricity or Acid. Water Works Systems installed. Prompt attention to inquiries.

Write for prices.

Manufactured by

Canadian Pipe Co., Limited

P.O. BOX 915 **Factory: 550 Pacific St., VANCOUVER, B. C.**

Write for catalog E which describes these buckets in detail and shows how they are used.

The Brownhoist Contractors' Bucket is an inexpensive bucket

for the contractors to use in handling sand, gravel, cinders, etc.

This bucket is of simple construction, and it is strongly built as can be seen from the illustration. The spades are reinforced on all sides to withstand the wear and tear of the contractors' hard service.

The digging edges on the bucket are of manganese steel and are beveled. And all bearings are equipped with manganese steel bushings. The manganese steel withstands the cutting tendency of the fine particles of sand, etc.

The Brown Hoisting Machinery Co. **Cleveland, O.**

New York, Pittsburgh, Chicago, San Francisco, The Colby Engineering Co., Portland, Ore.

NATIONAL PIPE & FOUNDRY CO., LIMITED
WATER WORKS CONTRACTORS
MANUFACTURERS OF
WOODEN WATER PIPE

For water works systems, domestic water supply and hydraulic mining. Insulated wire conduits; steam pipe casings; acid-proof pipe for mines, tanneries and pulp mills. Sizes from 2 inches to 24 inches.

WRITE FOR INFORMATION

802 McGILL BUILDING, MONTREAL
Works: ALEXANDRIA, ONT.

Wm. P. McNeil & Co.
Limited
New Glasgow — Nova Scotia

STEEL MERCHANTS
AND
MANUFACTURERS AND CONTRACTORS FOR

Steel Railway and Highway Bridges, Steel Frame and Mill Buildings, Structural Steel and Plate Work of any description.

Capacity 9000 tons per annum.

Shop is equipped with High Speed Electric Cranes and Modern Heavy Duty Tools, Can handle single pieces structural work of 40 tons.

Large Stock of Beams, Channels, Angles, Tees, Plates, etc., for prompt shipment.

Stock yard runway 800-ft. long, crane 70-ft. span.

Shipping runway 400-feet long, crane 80-ft. span.

Delivery yard runway 120-teet long, cranes 40-ft. span.

Orders and Inquiries Solicited

SAND & SUPPLIES
LIMITED

Spadina Avenue Dock
TORONTO

AYR
Ontario

Water Washed Sand
Pit Sand
Screened Gravel
Pit Run
Crushed Limestone
Crushed Granite

OUR plants at AYR and TORONTO are the most modern in the country and our materials are the best that can be produced.

Call Adel. 1947 and we will be pleased to give you all information regarding prices and deliveries.

James Thomson, President. J. G. Allan Vice-President. James A. Thomson, Secretary.

THE GARTSHORE-THOMSON PIPE & FOUNDRY CO.
LIMITED

Manufacturers

Flexible and Flange Pipe, Special Castings and all kinds of Waterworks Supplies.

CAST IRON PIPE

3 inches to 60 inches diameter
for Water, Gas, Culvert and Sewer

HAMILTON, ONT.

The Canada Iron Corporation, Limited

CAST IRON PIPE

Head Office:
Mark Fisher Building
MONTREAL

Iron Ore, Pig Iron, Car Wheels, Cast Iron Water and Gas Pipe, Specials, Valves, Hydrants, etc., Castings of all kinds, Mooring Bollards for both Concrete and Wooden Docks, Hoisting Machinery.

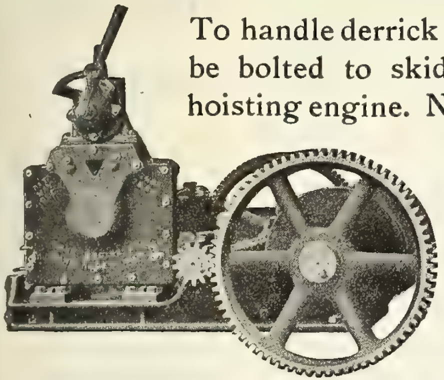
The Dake Swinging Gear

To handle derrick booms. Can be bolted to skids in front of hoisting engine. No dead center.

Start, Stop, Reverse at Will

WRITE FOR CATALOGUE CR.

Dake Engine Co.
Grand Haven, Mich.



When you want stone that appeals specify

"Queenston Blue" Limestone

Send us your specifications for Cut Stone work

The Queenston Quarry Co., Ltd.
ST. DAVIDS, ONT.

ROCALITE

The Ready Mixed
Hard Wall Plaster

Manufactured by

Alex. Bremner
Limited
100 Bleury Street - - MONTREAL

"Galvaduct" and "Loricated"

Conduits

for Interior Construction

Conduits Company, Limited
Sole Manufacturers under Canadian and U. S. Letters Patent
Toronto - Canada

CAWTHRA MULOCK, President - - GORDON F. PERRY, General Manager

NATIONAL IRON WORKS, Limited

LARGEST MANUFACTURERS IN CANADA OF

CAST IRON PIPE

every size for Water, Gas, Culvert or Sewer, Carried in Stock

Lake or Rail Shipments
Offices, Works and Docks, TORONTO

SEE

SMYTH & RYAN

for quotations on

Lime, Stone, Cement, Sewer Pipe, Fire Brick, Weeping Tile, Mortar Colors, Plaster, &c.

Toronto Agents for

OWEN SOUND CRUSHED STONE

Deliveries G. T. R. and C. P. R.

Head Office, 1327 Bloor Street West

Phones, Junc. 828,829.

Branch Yards, 53 Merton Street

Phone, North 4751 G.T.R. Belt Line

Night and Sunday calls, Phone, Parkdale, 2198.

RAILS

New and Relaying Switches, Turntables, Etc.

Carried in Stock

Locomotives and Cars

Jno. J. Gartshore, Toronto

"EBANO" and "EAGLE" Brands

MEXICAN ASPHALT

HERKIMER ST., HAMILTON. Paved with our Mexican Asphalt.

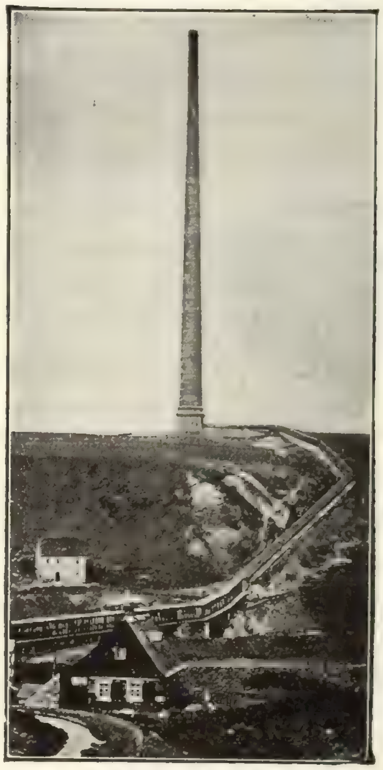
Write for analysis and samples

The

Asphalt & Supply Company, Limited

Sole Canadian Agents for the Mexican Eagle Oil Co.
Also Agents for MASTIC ASPHALT for Sidewalks.

428 Transportation Bldg., MONTREAL



460 feet x 8 feet 2 in.

World's Largest Chimney

Radial Brick chimneys are the only type that will not deteriorate from the effects of gases and erosion.

HEINICKE CHIMNEYS

will be found proving their superiority to over 4,000 users in every part of the country. The day of common brick and metal stacks is gone—if you are building a chimney make it a **HEINICKE.**

Write for catalogue

H. R. HEINICKE, INC. New York, U. S. A.

Representatives for Canada:

Black Building Supply Co,, Ltd., Toronto
Dartnell, Ltd., Montreal, Que.

IMPROVED EQUIPMENT CO.

EXECUTIVE AND SALES OFFICES 60 WALL ST, NEW YORK

COMBUSTION ENGINEERS

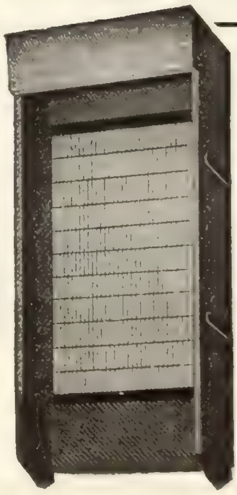
DESIGNERS AND *BUILDERS* OF

GAS BENCHES GAS PRODUCERS COMPLETE GAS PLANTS
GAS PLANTS FOR INDUSTRIAL PURPOSES BLUE WATER GAS
LIME KILNS LIME BURNING PLANTS SPECIAL INDUSTRIAL FURNACES
"TECO" BRAND OF REFRACTORY FIRE CLAY MATERIALS

Western Lumberman

Representing the Lumbering and Woodworking interests of
British Columbia Alberta Saskatchewan and Manitoba

Winnipeg, Man.



NOW is the time to renew your

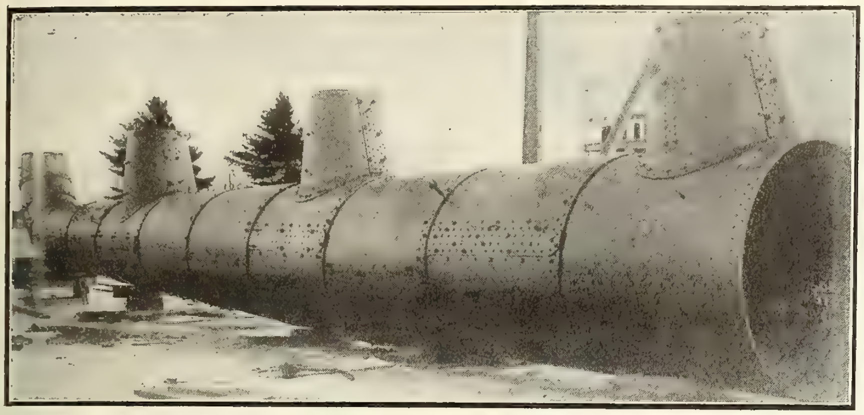
SAND and GRAVEL SCREENS

We make **SCREENS** for all purposes

Concrete Reinforcement, Window Guards, General Wire and Ironwork.

Shall be pleased to quote you.

Canada Wire & Iron Goods Co.
Hamilton



Erected at Seven Falls, Quebec, Distributor Pipe and Branches, under 450 ft. Head.

Structural and Steel Plate Work

is our specialty, We fabricate and erect from your drawings, or will design your structure for you.

No Work Too Large for us to handle in the minimum of time. May we estimate on your requirements?

WALSH PLATE & STRUCTURAL WORKS, LIMITED

Drummondville, Que. Holyoke, Mass.

Mahan & Company

908-909 Chamber of Commerce Building
Chicago, Ill.

Block, Sawed, Planed
and Turned

Bedford Stone

Quarries and Mills
near Clear Creek, Indiana

Chicago Mill and Storage Yard:
2126-2142 So. Kedzie Ave. and C. B. & Q. Tracks

Representative, Toronto, Canada,
H. R. IVOR, Rooms 8-10, No. 34 Yonge Street

Producers of the Celebrated

"Peerless"
Bedford Stone

Bedford Indiana Limestone

Mill Blocks
Sawed, Planed and Turned Stone

W. McMILLAN & SON
(Incorporated)

General Offices
918 Otis Building
CHICAGO, ILL.

Quarries and Mills { Bedford, Ind.
Bloomington, Ind.

THE H. & E. PATENT BALL-BEARING LIFTING JACKS

For Railway and Bridge Work, Contractors' and Builders' Use

Made by practical Jack Builders. Material: best grades of malleable iron and steel Fully guaranteed as to durability and efficiency. The long even stroke of the lever together with the design and careful construction of the jack, makes it the quickest and easiest working lifting appliance on the market. Made in plain and foot-lift styles. Adapted to all classes of work where a lifting jack can be used. Sizes from 8 to 50 tons capacity now complete. Send for prices and discounts.

To any responsible Firm or Railway in Canada any of these jacks will be sent on 30 days trial.

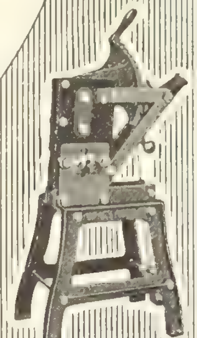
MANUFACTURED BY
Canada Lifting Jack Co., Ltd.
(Formerly the H. & E. Lifting Jack Co.)
Waterville, Que.

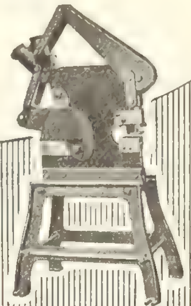
Stock carried by F. H. Hopkins & Company, Montreal

"Buffalo" Punches Shears and Drills

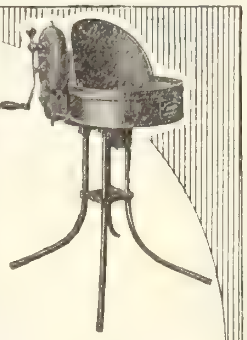
Among our recent designs is the Bar Cutter No. 10 for cutting concrete reinforced bars—twisted, round or any other shape. It cuts bars up to 1¼" thick and, due to its steel frame, its **weight is only half** that of a cast iron machine of the same capacity. Ask for catalog of Steel Punches, Shears and Drills No. 145.

Canadian Buffalo Forge Co.
MONTREAL Limited
St. John Winnipeg
Toronto Vancouver





"Buffalo" Forges



"Built to Last"

is the slogan of our **1912 Rivet Forge.** The repair cost by this design is guaranteed to be actually **cut in two,** compared with any other forge now in the market. A bridge company using a large number of forges writes us regarding it: "The operator claims it runs easier and heats more rivets in less time than any forge he has ever used." Let us send you one on free trial. Fifty other styles, for light and heavy work.

Canadian Buffalo Forge Co.
Limited
Montreal
St. John Winnipeg
Toronto Vancouver

Structural Water-proofing

"DEHYDRATINE"

For Water-proofing under the membranous method.

"HYDRATITE"

For Water-proofing Concrete.

"FERRO FAX"

For Surface Hardening Concrete Floors.

"SYMENTREX"

A Cement Coating—Makes Surfaces Water Shedding.
MADE IN COLORS

"These Trade Names protect you against the possible selection of inferior materials. Whether you prefer a water-proof paint or a compound, we can give you satisfactory assurance as to the reliability of these products."

"FOR 15 YEARS STANDARD OF THEIR KIND."

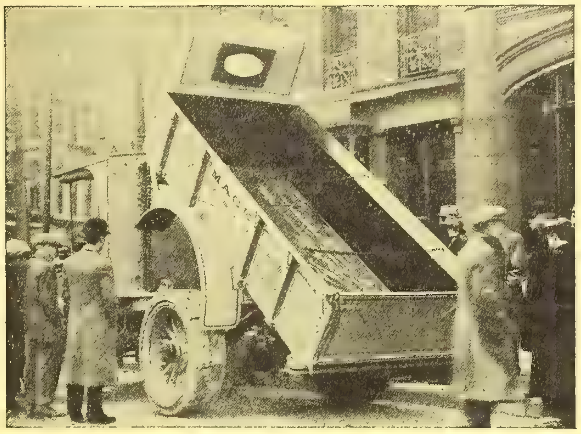
Pinchin-Johnson & Co.

(Canada) Limited
Minerva House, - Toronto
Write for Particulars and Architect's Hand Book (1913 edition)

AGENCIES IN ALL CITIES

MACK

You Can Dump a Load in 35 Seconds Without Leaving Your Seat



Among the problems confronting the contractor, the disposal of waste and the haulage of building material is one of the most important. The motor truck solves this problem for you quickly and economically.

The power dump truck, on which the body of the truck is raised by a shaft geared to the main engine drive, is one of the greatest labor and time saving features of motor truck work. It is operated by the driver without leaving his seat and may be stopped and held at any angle.

In dumping stone, sand and other road building material the body can be held at the desired elevation and the truck driven slowly ahead, spreading the load as it moves along.

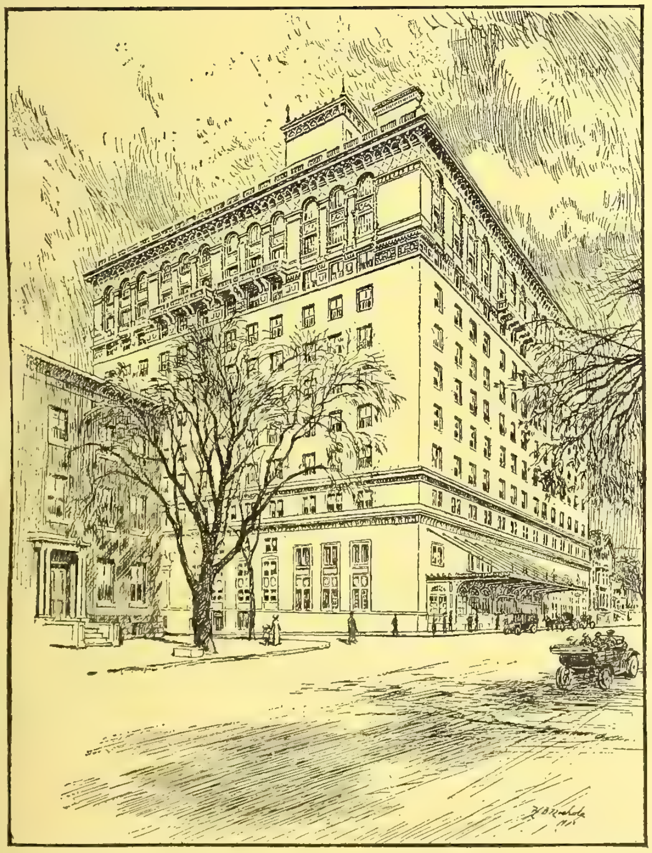
When you buy a Mack Truck you do not buy Theory but History. Mack Trucks have proven their reliability by 12 years of real service.

Let us give you the facts about the Mack and how it makes dollars for contractors. Write to-day.

The Canadian Fairbanks-Morse Co., Limited

St. John, N.B. Quebec Montreal Ottawa Toronto Winnipeg Saskatoon Calgary Vancouver

11



Across Canada with the Imperial Wire & Cable Company, Limited

Toronto Montreal Winnipeg

First of a series of advertisements showing buildings of national importance which have been wired with Imperial Wire & Cable Co.'s, Limited, wires.

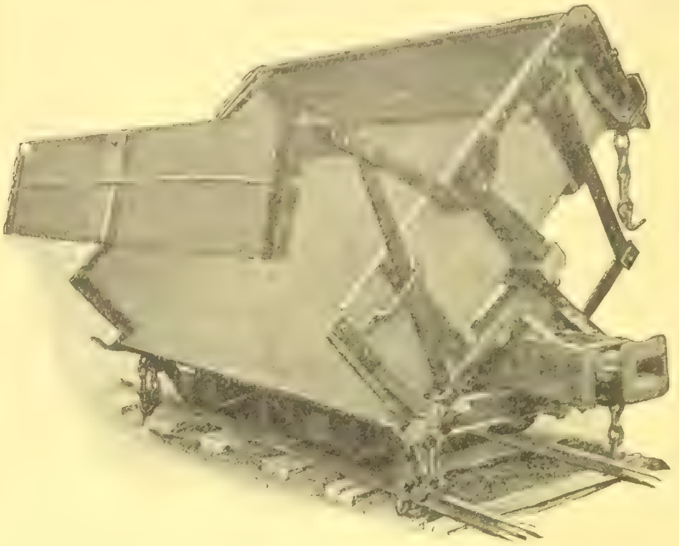
This picture shows

The Ritz-Carlton Hotel, Montreal

Architects—Warren & Wetmore—New York.
Engineers—Mailloux & Knox—New York.
Electrical Contractors — J. Livingston & Co. —New York.

This hotel was wired with "Imperial" Higrade Rubber Insulated Wire.

Address enquiries to nearest office, Montreal, Toronto, Winnipeg; Alberta and British Columbia enquiries to Northern Electric & Manufacturing Co., Limited, Calgary and Vancouver.



"KILBOURNE & JACOBS"

Dump Cars

Our Dump Cars will give you entire satisfaction. We can supply cars in all capacities for any practical gauge. Wheels are all properly chilled and the construction and material used are the best.
Our Cars are declared by steam shovel and car men to be superior to all others, both in construction and operation.

Let us have your enquiry, we would be pleased to submit full particulars and prices at any time.

"Davenport" Saddle Tank Locomotives

For Contractors and Quarry Service

Supplied in any size for any practical gauge track.

"Marion" Steam Shovels

For Railroads — Contractors — Brickyards, Etc.

We supply Steam Shovels in all sizes. Can furnish both Standard and Revolving types. Write us stating your special requirements and we will be pleased to submit proposition.

F. H. Hopkins & Co.

MONTREAL

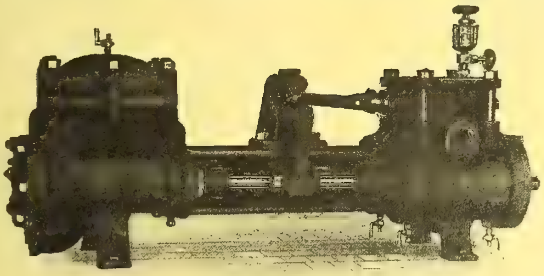
BRANCH OFFICES: **General Supply Company of Canada, Ltd., Winnipeg Agents**
Ritchie Contracting & Supply Company, Ltd., Vancouver Agents

Vol. 27 Toronto, July 16, 1913 No. 29

ESTABLISHED 1886

Contract Record and Engineering Review

Steam and Power Pumps, Condensers and Travelling Cranes



The Smart-Turner Machine Co. LIMITED
HAMILTON, CANADA

"MADE IN CANADA"

Bent Glass

Made in all Kinds of Glass on Short Notice

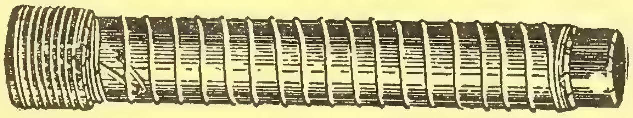
Large Bent Plate Glass for Shop Fronts a Specialty

The Toronto Plate Glass Importing Company, Limited
(HILL & RUTHERFORD, Managing Directors)
Head Office and Works: 91 to 133 Don Roadway
TORONTO

Air Compressors
OF BELLISS MAKE
have gained their reputation for

Simplicity of Design
Noiseless Running
Compact Design
Low Oil Consumption
Continuous Operation
Overall Efficiency

Messrs. Belliss & Morcom, Ltd.
BIRMINGHAM, ENGLAND
Agents
Laurie & Lamb
Board of Trade Building, MONTREAL



Continuous and Machine Banded Wood Stave

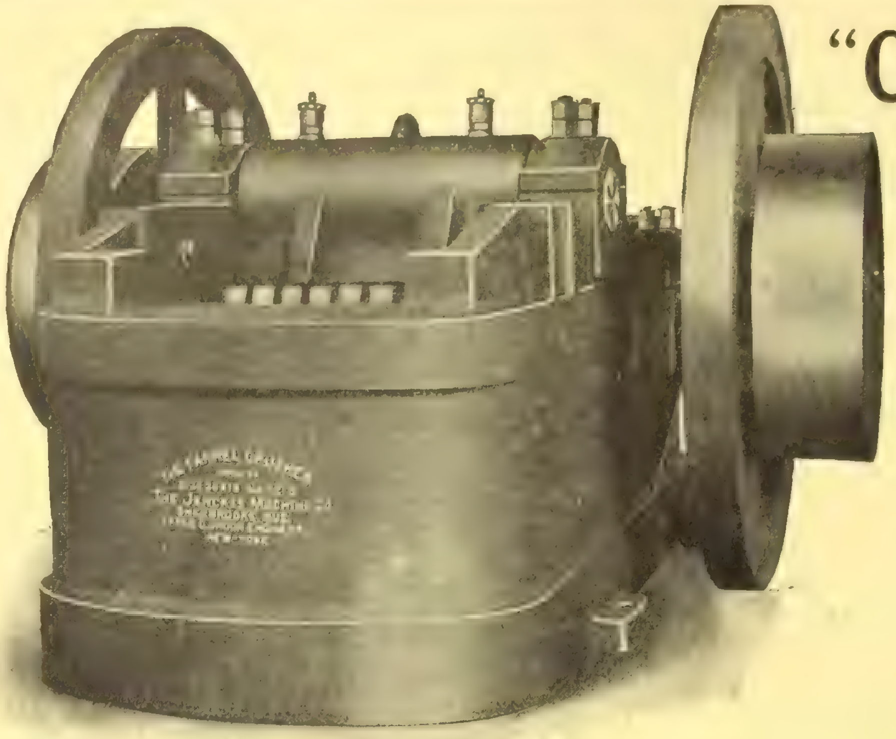
WATER PIPE

RESERVOIR TANKS

for city and town Water Systems, Fire Protection, Power Plants, Hydraulic Mining, Irrigation, etc. One-half the cost of Iron Pipe—and better.

Pacific Coast Pipe Co., Limited
P. O. Box 563 Vancouver, B. C.
Office and Factory, Granville St., near High Bridge
WRITE FOR CATALOGUE
Full Particulars and Estimates Furnished

Alphabetical Index of Advertisers, Page 16 Classified Directory to Advertisements, Page 6



"CRUSHERS"

Complete Crushing Plants

Our Specialty

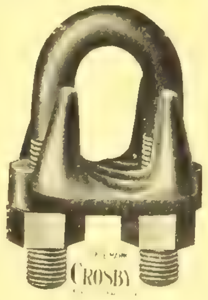
Many Years Experience and Exceptional Facilities

Ask for Copy of New Catalogue

THE JENCKES MACHINE COMPANY, LIMITED

General Offices: Sherbrooke, Que. Works: Sherbrooke, Que. - St. Catharines, Ont.

Sales Offices:—Sherbrooke, Montreal, St. Catharines, Cobalt, So. Porcupine, Vancouver, Nelson



IF YOU ARE A CONTRACTOR

Using Wire Rope

YOU NEED THE

GENUINE "CROSBY" CLIP

IT HOLDS

Drop forged steel—Galvanized, cannot break, slip nor rust. Has nine times the strength of cast clips.

Made By

American Hoist & Derrick Co.

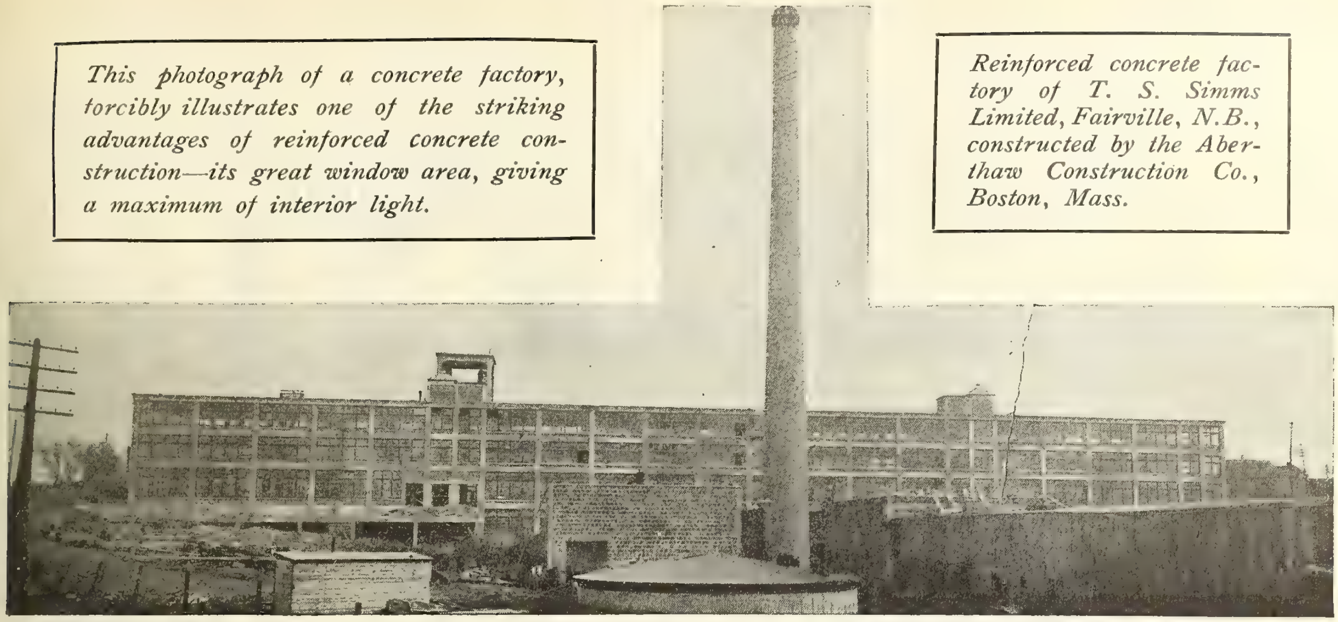
St. Paul, Minn.

SOLD BY

Dominion Wire Rope Co , Limited.—Montreal, Can.
General Supply Co. of Canada, Ltd., Montreal, Ottawa, Toronto, Canada.
Stuart Machinery Co.—Winnipeg, Man. Vancouver Machinery Depot, Ltd.—Vancouver, B. C.
Gorman, Clancey & Grindley—Edmonton and Calgary Alta., and Nelson, B. C.

This photograph of a concrete factory, forcibly illustrates one of the striking advantages of reinforced concrete construction—its great window area, giving a maximum of interior light.

Reinforced concrete factory of T. S. Simms Limited, Fairville, N.B., constructed by the Aberthaw Construction Co., Boston, Mass.



Concrete Factories are Most Efficient

The efficiency of a machine is the ratio of the amount of work a machine does to the amount of work required to operate it. The output is equal to the input minus the work lost or wasted. The less wasted the greater the efficiency.

In the same way the efficiency of a factory may be defined as the ratio of output to input. Output financially, is increased by reducing unnecessary expenses.

Concrete Stops Wastes

Concrete buildings are proof against fire, water and vermin. They give the maximum light and are sanitary. They resist vibration, and are permanent and durable.

Fire-proofness reduces insurance rates. Water or liquids used in certain processes will not leak through floors to destroy valuable goods below. Rats and other vermin find no place to live in a concrete building, thus eliminating losses from this cause. Maximum light and sanitary conditions increase efficiency of employees. Lack of vibration reduces wear and tear on machines. Permanency and durability reduce depreciation.

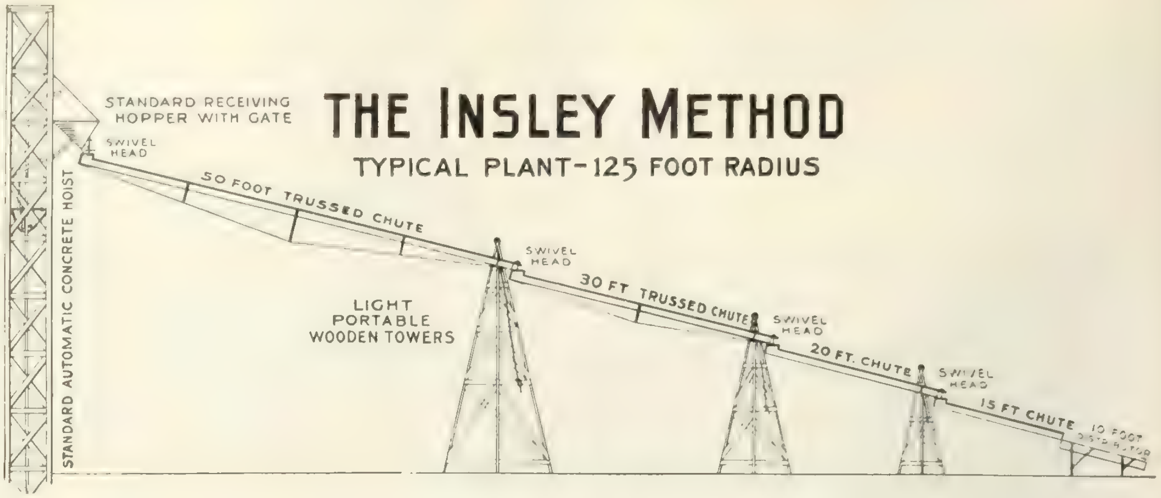
The way in which concrete stops these leaks is fully described in our handsomely illustrated 224 page book, "Factories and Warehouses of Concrete." It contains photographs and data of factories and warehouses for all classes of industries.

You can have a copy free if you will mention this advertisement.

Canada Cement Company

Limited

Montreal



THE INSLEY METHOD

TYPICAL PLANT—125 FOOT RADIUS

of distributing Concrete saves th Cost and Inconvenience of Runway and a very considerable percentag of the labor and time required t complete the work.

It is the Best Concrete Distributin Plant ever place on the market.

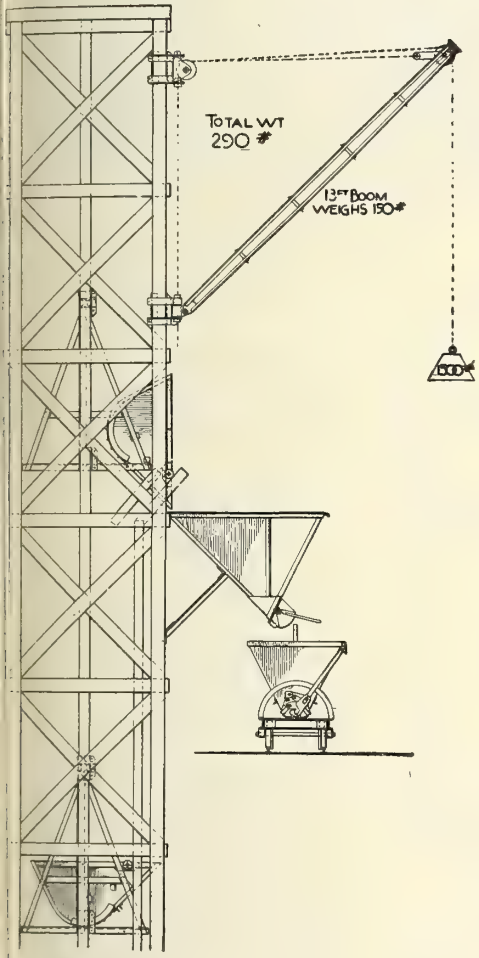
Low in the firs cost, durable i construction, surprisingly econom ical in cost o operation.

Montreal, 318 St. James St.
Toronto, 155 West Richmond St.
Cobalt, opp. Right of Way Mine.
Winnipeg, 259-261 Stanley St.

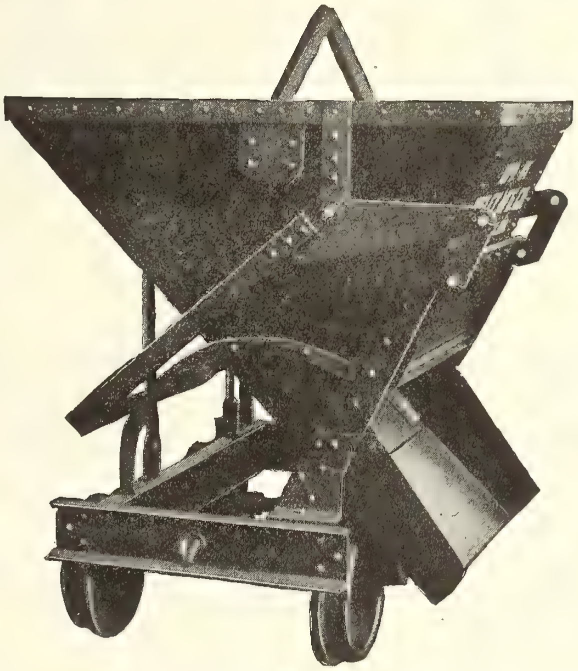
MUSSEN

Handle Your Concrete with

INSLEY MATERIAL



- Automatic Hoists
- Receiving Hoppers
- Concrete Spouting
- Derricks
- Stone Skips
- Buckets
- Adjustable Steel Column
- Clamps
- Spreader Carts
- Etc.



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LIMITED

Calgary, 10th Ave. & 3rd St. E.
Vancouver, 365 Water Street
Quebec, 71 Maple Ave.
St. John, N.B., 57 Smythe St.
Halifax, 78 Granville St.

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The following regulations apply to all advertisers:—Eighth page, two headings quarter page, four headings; half page, eight headings; full page, sixteen headings.

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Canadian Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd.
Escher Wyss & Co.

Architects
Weeks, Arthur L.

Architects' Instruments
Stanley Co., W. F.
Ainsworth & Sons, Wm.
W. & L. E. Gurley.

Architectural Iron Work
Canadian Allis-Chalmers, Limited.
Canada Wire & Iron Goods Co.
Dennis Wire & Iron Works.
Dom. Ornamental Iron Works.
McGregor & McIntyre
Meadows Co. Geo. B.
Steel & Radiation Ltd.

Architectural Metal Work
Feather & Roadhouse.
Ormsby Co., Limited, A. B.
Metal Shingle & Siding Co.
Metallic Roofing Co.

Architectural Terra Cotta
Black Building Supply Co., Ltd.
Don Valley Brick Works.
Gibbs & Canning.
Northwestern Terra-Cotta Co.
Toronto Plate Glass Imp't'g Co.

Asphalt
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Barber Asphalt Paving Co.
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Goodyear Tire & Rubber Co.
Can. Fairbanks-Morse Co.
Dominion Belting Co.

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Can. Ingersoll-Rand Co., Ltd.
Canadian Sirocco Co.
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Sheldons Limited
Sturtevant Co. of Can. Ltd., B. F

Boilers
Berg Machinery Mfg. Co.
Canadian Allis-Chalmers, Limited.
Boving Company of Canada.
Inglis Co., John.
Jenckes Machine Co.
Leonard & Sons, E.
Marsh & Henthorn.
McDougall Caledonian Iron Wks.
Mussens Limited.
Waterous Engine Works Co.

Boxes—Junction.
Standard Underground Cable Co. of Canada Limited.

Brewers' Machinery
Linde British Refrigeration Co.

Brick
American Enamelled Brick Co.
Black Building Supply Co., Ltd.
Bradford Pressed Brick Co.
Douglas Milligan Co.
Don Valley Brick Works.
Hamilton Pressed Brick Works.
North-Western Terra Cotta Co.
Nova Scotia Clay Works.
Sydney Pressed Brick Co.

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Canadian Kellogg Co.
Douglas Milligan Ltd.
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Bechtels Limited
Berg Machinery Mfg. Co.
Sheldons Limited

Brick Dryers
Bechtels Limited.
Berg Machinery Mfg. Co.
Canadian Buffalo Forge Co.

Bridges (Steel)
Canadian Allis-Chalmers, Limited.
Canadian Bridge Co.
Chicago Bridge & Iron Works.
Des Moines Bridge and Iron Co.
Dickson Bridge Works.
Dominion Bridge Co.
Hamilton Bridge Works Co.
Mackinnon-Holmes & Co.
McNeil & Co., W. P.
National Bridge Co.
Phoenix Bridge & Iron Works.
Sarnia Bridge Co.
Scherzer Rolling Lift Bridge Co.
Structural Steel Co.
Standard Steel Construction Co.

Buckets
American Hoist & Derrick Co.
Browning Engineering Co.
Canadian Fairbanks-Morse Co.
Lecky & Collis.
Thew Shovel Company.

Cable
Canada Wire & Cable Co.
Imperial Wire & Cable Co.
Standard Underground Cable Co. of Canada, Limited.

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Alsen Portland Cement Co.
Britnell & Co.
Bremner, Alex.
Canada Cement Co.
McNally & Co., W.
Morrison & Co., T. A.
Ontario Lime Co., Ltd.
Rogers, Alfred Limited
Smyth & Ryan.

Cement Tools
Abram Cement Tool Co.
Wettlaufer Bros.

Coal Chutes
Galt Stove & Furnace Co.

Coal Handling Apparatus
American Hoist & Derrick Co.
Browning Engineering Co.
Brown Hoisting Machinery Co.

Combination Woodworkers
Hutchinson, M.

Concrete Mixers and Appliance ..
Blystone Machinery Co.
Canadian Allis-Chalmers, Limited.
Canadian Concrete Appliance Co.
Chain Belt Company.
Hopkins & Co., F. H.
Koehring Machine Co.
Lecky & Collis.
London Concrete Machinery Co.
Mun. Eng. & Contracting Co.
Mussens Limited.
Waterloo Cement Machinery Co.
Wettlaufer Bros.
Woodstock Wind-Motor Co.

Conduits
Can. H. W. Johns-Manville Co.
Conduits Co., Limited.

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Eastern Pipe Construction Co.
Foundation Co.
Reggin & Spence.

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Dore & Fils.
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Hopkins & Co., F. H.
International Marine Signal Co.
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Marsh & Henthorn.
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Royce Limited.
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Troy Wagon Company.
Woodstock Wind-Motor Co.
Wettlaufer Bros.

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Weller Mfg. Company.

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Can. Ingersoll-Rand Co., Ltd.

Cork Installation Machinery
Linde British Refrigeration Co.

Corrugated Iron
Can. H. W. Johns-Manville Co.
Metallic Roofing Co.
Ormsby, A. B., Limited.

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Browning Engineering Co.
Brown Hoisting Machinery Co.
International Marine Signal Co.
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Cabot, Inc., Samuel.

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Ontario Lime Co., Ltd.
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Hopkins & Co., F. H.
Jenckes Machine Co.
Lecky & Collis
London Concrete Machinery Co.
Mussens Limited.
Wettlaufer Bros.

Derricks and Derrick Fittings
American Hoist & Derrick Co.
Hepburn, John T.

Dredges
Beatty & Sons, M.
Browning Engineering Co.

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Canadian Allis-Chalmers, Limited.
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Star Expansion Bolt Co.

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Harvey, J.

Drill Steel Sharpeners
Canadian Ingersoll-Rand Co.

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Bechtels Limited.
Schell Foundry & Machine Co.
Western Wheeled Scraper Co.

Electric Air Rock Drills
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Electrical Machinery and Supplies
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Ferranti Electrical Co.

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Canadian Buffalo Forge Co.
Inglis Co. John.
Jenckes Machine Co.
Laurie & Lamb.
Leonard & Sons, E.
McDougall Caledonian Iron Wks.
Mussens Limited.
Sturtevant Co. of Can. Ltd., B. F
Waterous Engine Works Co.
Wettlaufer Bros.

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Bowman & Connor.
Campbell, R.
Chipman & Power.
Farmer, John T.
Galt Engineering Co., John
Lea & Ferguson.
Mitchell, C. H.
Thorold Co., F. W.

Expansion Bolts
Star Expansion Bolt Co.

Expanded Metal
Mannesmann Tube Co.

Exhaust Heads
Canadian Buffalo Forge Co.
Sheldons Limited.
Sturtevant Co. of Can. Ltd. B. F.

Field Instruments
Gurley, W. & L. E.

Filler, Floor and Sewer Joint Asphalt
Canadian Mineral Rubber Co.

Filters
American Water Softener Co.

Fire Brick
Improved Equipment Co.
Ontario Lime Co., Ltd.
Smyth & Ryan.

Fire Escapes
McGregor & McIntyre

Fireproof Doors and Windows
Feather & Roadhouse.
Metal Shingle & Siding Co.
Mussens Limited.
Ormsby Co., Limited, A. B.
Steel & Radiation Ltd.

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Lecky & Collis.

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Wettlaufer Bros.

Gas Plants Complete
Improved Equipment Co.

Gas Producers for Heating
Improved Equipment Co.

Gas Machinery
Improved Equipment Co.

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Consolidated Glass Co.
Hobbs Mfg. Co.
Luxfer Prism Co.
Toronto Plate Glass Imp't'g. Co

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Sheldons Limited

High Pressure Pipe Lines
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Escher Wyss & Co.
Pittsburgh Valve, Foundry & Construction Company.

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Mussens Limited.
Royce Limited
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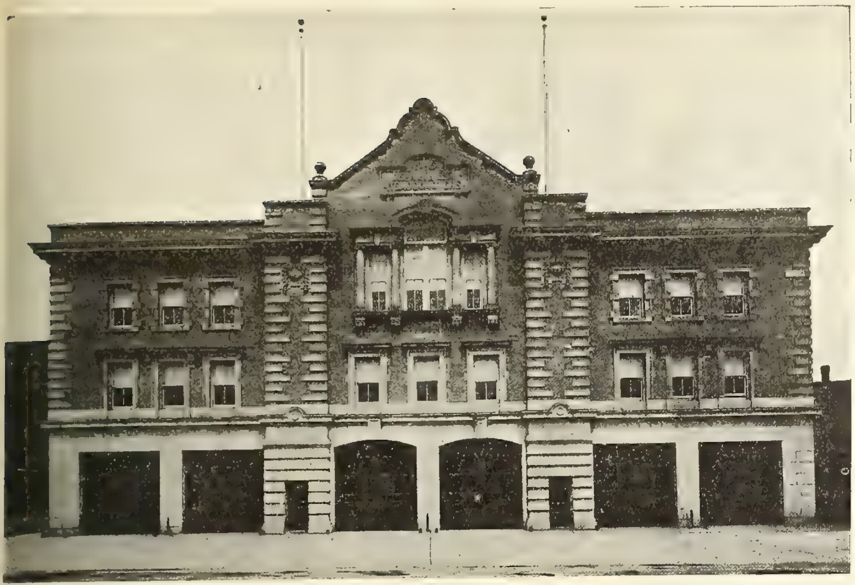
Canadian Fairbanks-Morse Co.
Wettlaufer Bros.

Hydrants
Canada Iron Corporation.
Gartshore-Thomson Pipe Co.
Kerr Engine Co.

(Continued on page 12)



Headquarters, Fire Department, Adelaide St. West, Toronto

Don Valley Bricks

The above building erected under the supervision of Toronto's city architect is built of Don Valley Clay Products.

Don Valley Eaton Oriental Brick was used for the outer walls and the building is fire-proofed throughout with Don Valley Porous Terra Cotta. The result is an imposing fire-proof building that will look as fresh and clean cut in twenty years as it does to-day.

For pleasing and permanent effects in brick work

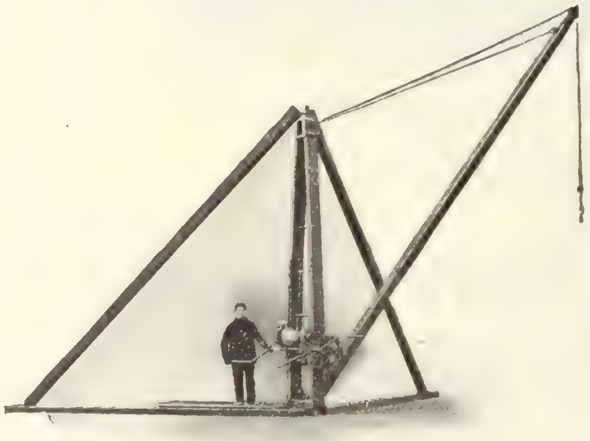
Specify "Don Valley Brick"

Don Valley Brick Works

Toronto, Ont.

Beath Scotch Derricks

Hand or Power



THE construction of Beath Scotch Derricks embodies several points of merit not found in other makes.

All stress parts are **steel** not cast iron. Bottom Pintle Bearing is of ball and socket type and works in a bath of oil, thus ensuring an easy movement at this joint.

Beath Derricks are provided with self-oiling bearings, ensuring easy operation and reducing wear to a minimum.

We also make Jinniwink Derricks, Stiff Leg Derricks, Guy Derricks, and Steel Derricks for heavy service. Hand or Power operated.

Send us your enquiries for Derricks

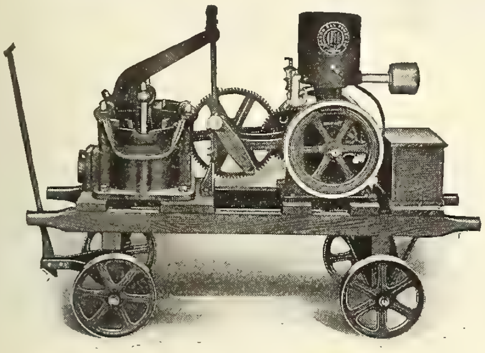
W. D. Beath & Son, Limited

ENGINEERS AND MANUFACTURERS

20-30 Cooper Ave., Toronto

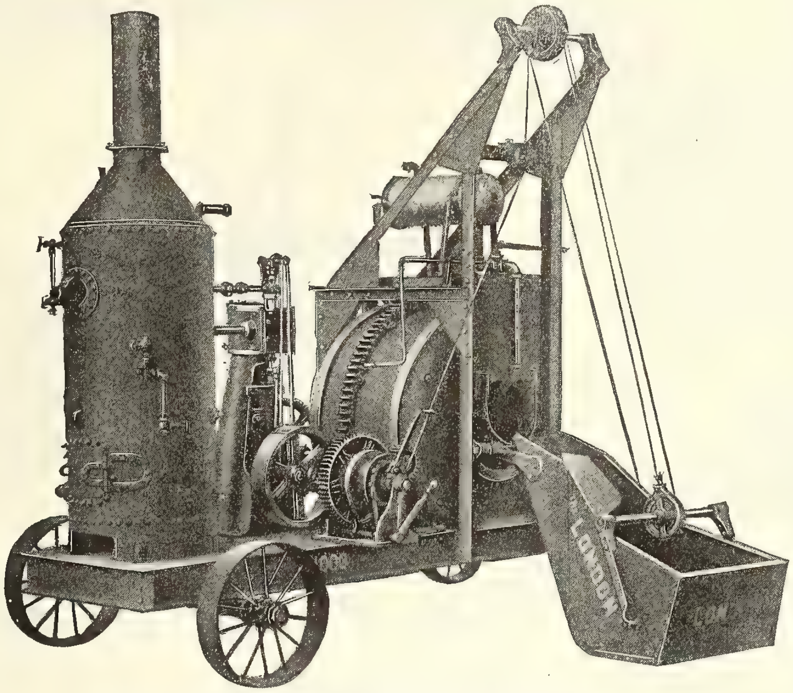
Before You Buy Concrete Machinery

or Equipment of any kind, write us for our 180 page catalogue.

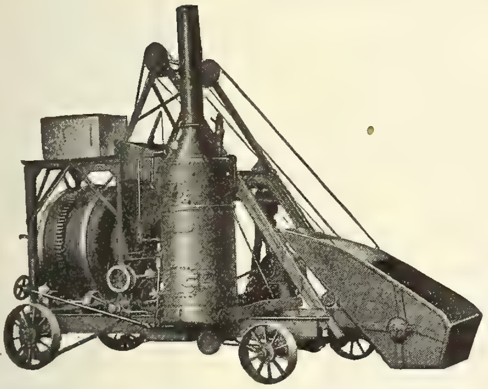


Power Diaphram Pump

We are the largest manufacturers of Concrete Machinery in Canada.



London Standard Drum Batch Mixer
This machine is built in five sizes, fitted with any kind of power ; also with traction drive if required.



Rear Discharge Traction Mixer. This machine is also equipped with Boom.

We do not build machinery down to a price but up to a standard.

London Sill Step and Window Cap Mould

A few lines we manufacture—

Concrete Mixers, Mortar Mixers, Tile Moulds, Drain Tile Machines, Side Walk Tile Machines Cement Block Machines, Cement Brick Machines, Sill Step and Window Cap Moulds Gasoline Engines, Screens and Elevators Fence Post Moulds, Hoisting Engines, Material Elevators, Concrete Carts, Wheelbarrows, Scrapers, Sidewalk Forms, Pumping Outfits

A complete line of Contractors' Tools.

London Concrete Machinery Co., Limited

Head Office and Factory: Cabell St. and Kitchener Ave., London, Ont.

BRANCHES:
WINNIPEG (445 Main St.) W. H. Rosevear, Mgr. CALGARY (622 9th Ave. W.) P. D. McLaren, Mgr.
TORONTO (60 Richmond St. W.) F. D. Emsley, Mgr.

AGENCIES:
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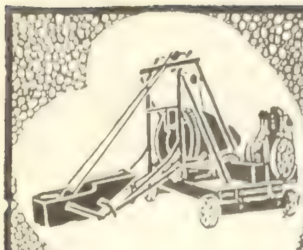
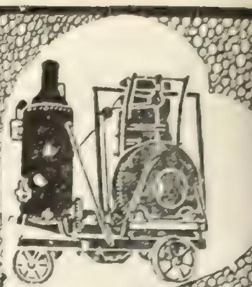
FORT WILLIAM, Northern Eng. & Supply Co. MONTREAL, Foss & Hill Mach. Co. QUEBEC, A. D. Masson

The Largest Manufacturers of Concrete Machinery in Canada

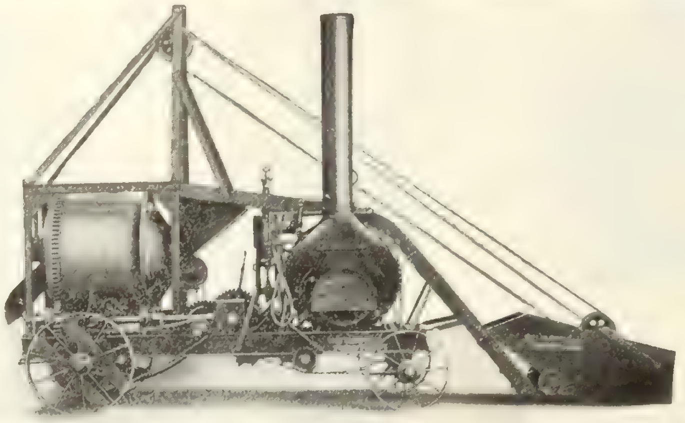
Wettlaufer Bro's IMPROVED CONCRETE & ROAD MACHINERY





MIXERS

HOISTS



With a Horizontal Boiler

¶ The horizontal boiler is an important feature of the new Wettlaufer Improved Stationary Heart Shape Drum Traction Mixer.

¶ This boiler effects a great saving in fuel—flues are always totally covered by water thereby lengthening their life.

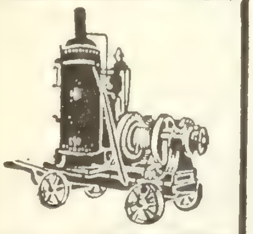
¶ The furnace is the full length of the boiler and has a large combustion chamber.

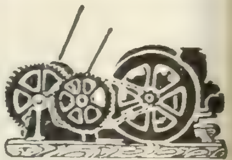
¶ The loading skip, which is the same width at both ends, comes flat down to the ground making far easier loading.

¶ The material is turned in every possible manner while being mixed and may be discharged with great rapidity.

¶ This mixer includes many other features which are daily demonstrated at all our branches. If interested—Come.

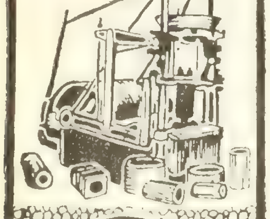
Write for our Catalog.

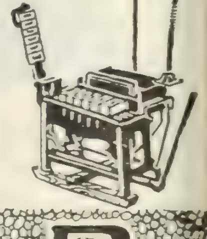




TILE MACHINES

BRICK MACHINES



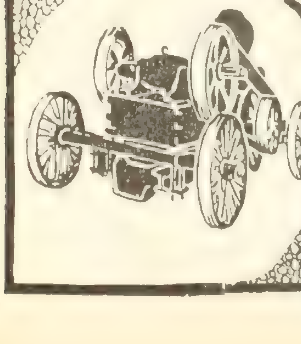


CRUSHERS

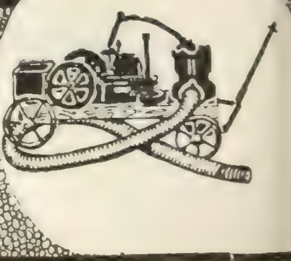
PUMPS

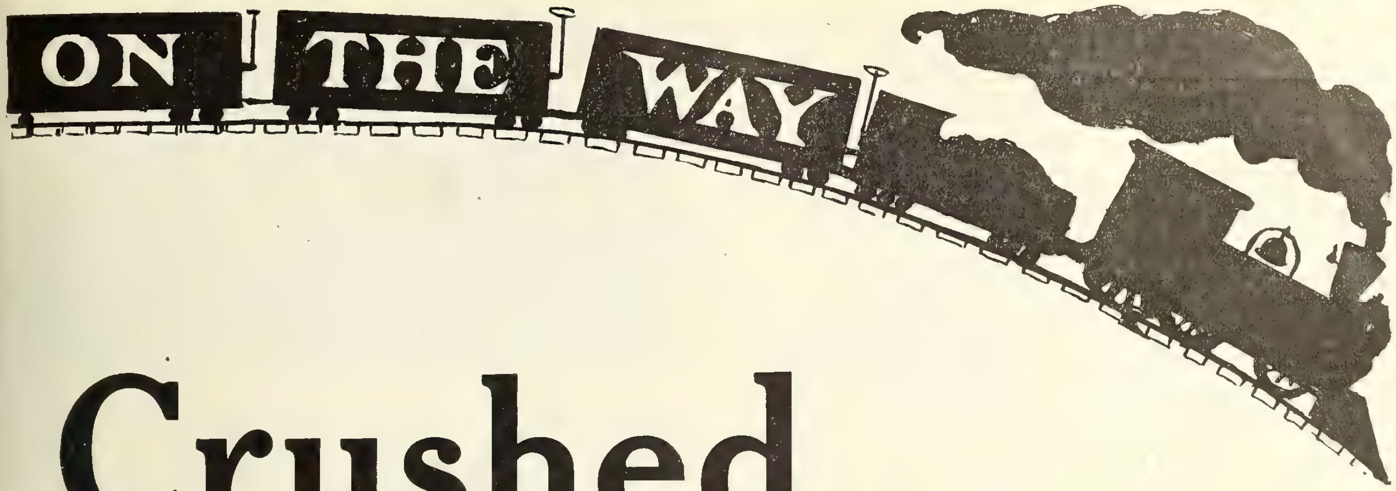
Wettlaufer Brothers
178 Spadina Ave., Toronto, Ont.
Factories: Mitchell, Ont., Buffalo, N.Y., Detroit, Mich.

AGENCIES:
A. E. Hodgert, Regina, Sask. Maysmith & Lowe, 1057 Mears St., Victoria, B.C. A. R Williams Machinery Co., 15 Dock St., St. John, N.B. The Canadian British Engineering Co., Ltd., 324 Smith St., Winnipeg, Man. R.F. Mancill, 405 Cadogan Blk., Cal. The Hallman Machinery Co., 374 Alexander St., Vancouver, B.C. J.L. Lachampe, 363 St. Paul St., Quebec.
Montreal Office and Warerooms: 316 Lagauchetiere St. W.



THE FAMOUS WETTLAUFER HEARTSHAPE MIXERS





Crushed Stone

If you want crushed stone in a big hurry come to us and you will get it.

Our bins are always loaded to the top with stone of all grades and shipments can be made the day your order is received.

Quarries located at Dundas and Vinemount.

Portland Cement

Our several cement mills are located at various points that enable us to make prompt shipments with short hauls.

Send us your next order.

Alfred Rogers
Limited
28 King St. West, Toronto

CLASSIFIED INDEX TO ADVERTISEMENTS—CONTINUED

Ice-making Machinery
- Linde British Refrigeration Co.

Insulating Compounds
- Canadian Mineral Rubber Co.
- Standard Underground Cable Co. of Canada, Limited.

Interior Finish and Doors
- Batts Limited
- Canada Office & School Fur. Co.
- Rhodes Curry & Co.

Kilns
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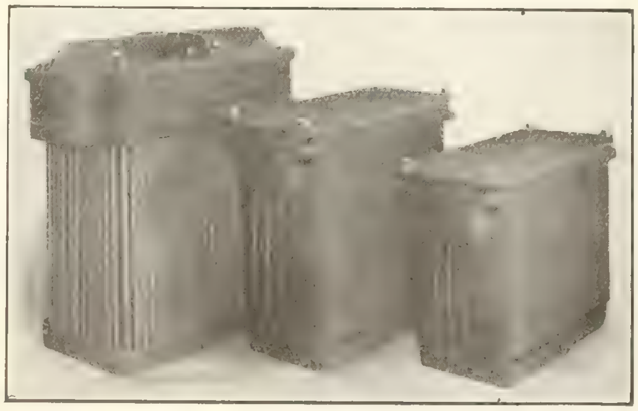
Reduced Loss Increased Profit — Ferranti Transformers



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All coils are wound with copper of ample sectional area, thereby reducing copper losses to a minimum.

Three phase transformers are the most economical type to operate and will effect a considerable saving in construction cost.

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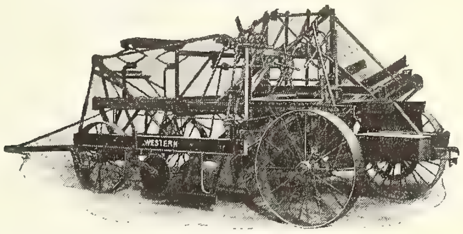

Hagersville Crushed Stone

The Toughest Stone for Macadam in Ontario

Record of Logan Avenue, Toronto, Macadamized from Queen St. to Gerrard St., in 1902

Length 2,454 Lin. Ft. Width 24 Lin. Ft. 6,550 Sq. Yds.

COST FOR REPAIRS	1903	$ 0.00	1908	$ 93.26
	1904	3.30	1909	200.46
	1905	9.35	1910	14.07
	1906	37.33	1911	2.29
	1907	16.11		

Total $376.17 or 5⅔c. per sq. yd. for repairs for nine years, a little over 6-10 of 1c. per sq. yd. per year.

Why Not Use Hagersville Stone and Get These Results?

Hagersville Contracting Co.
Hagersville, Ont. Limited

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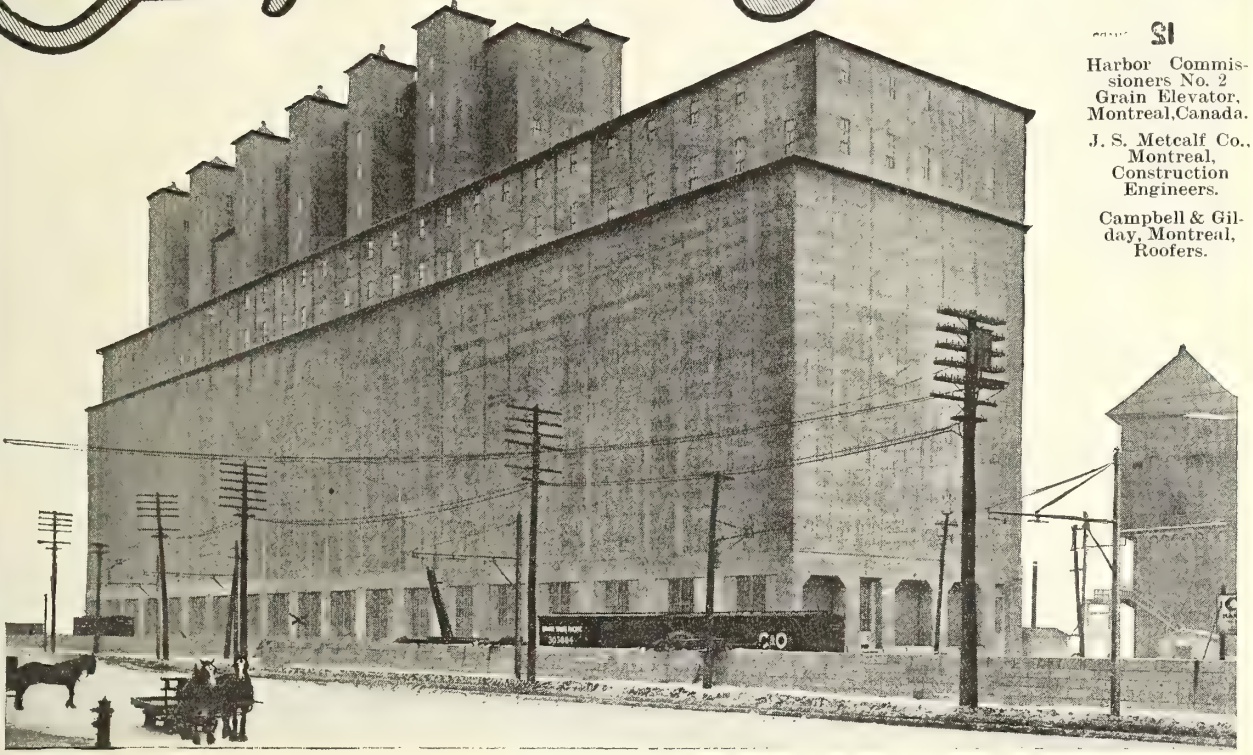

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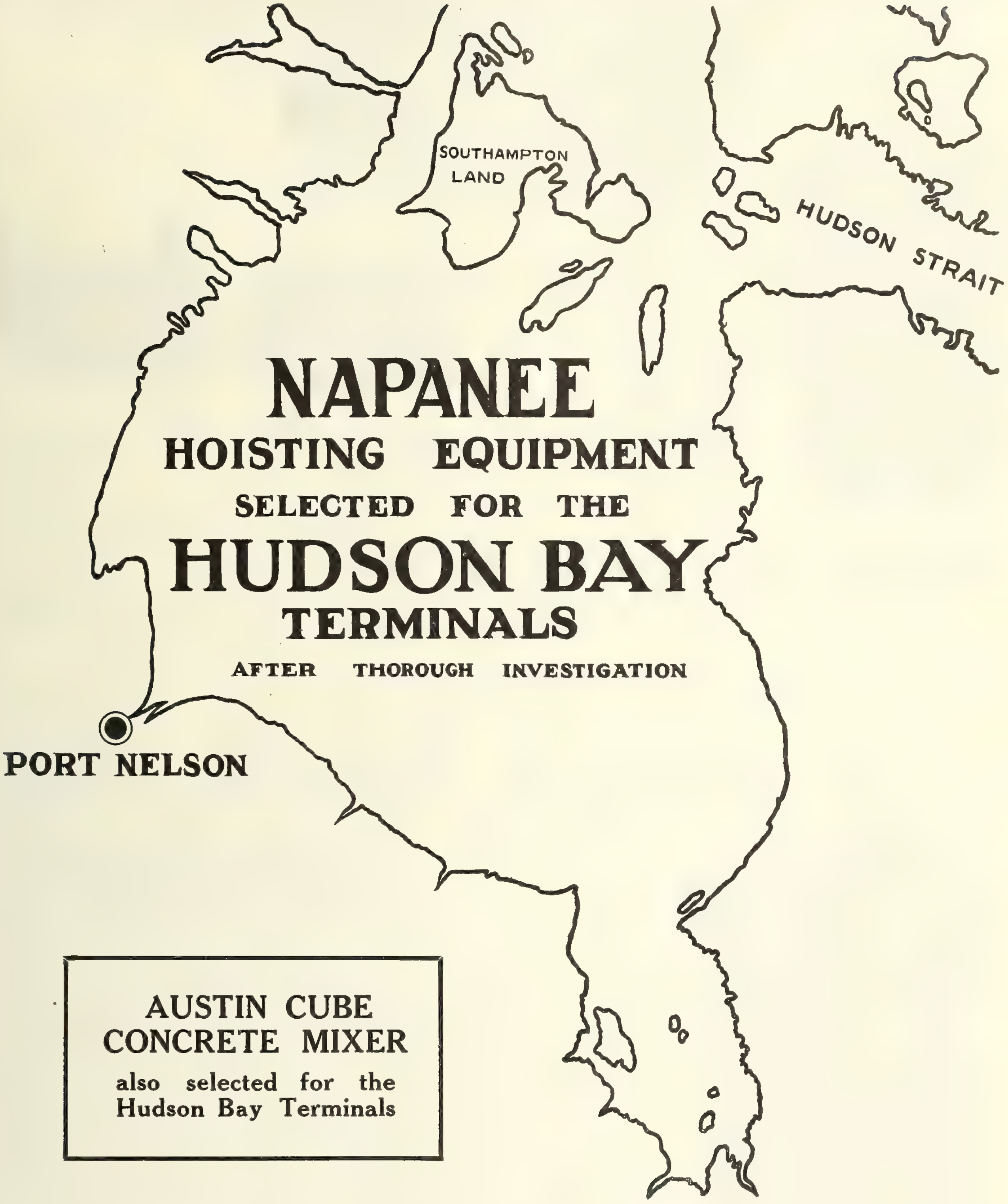

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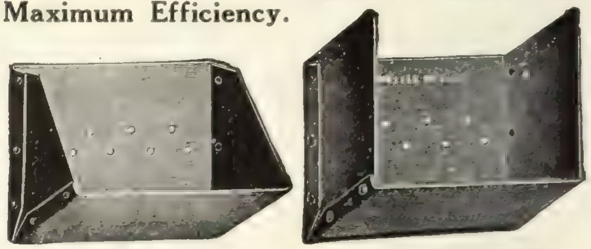

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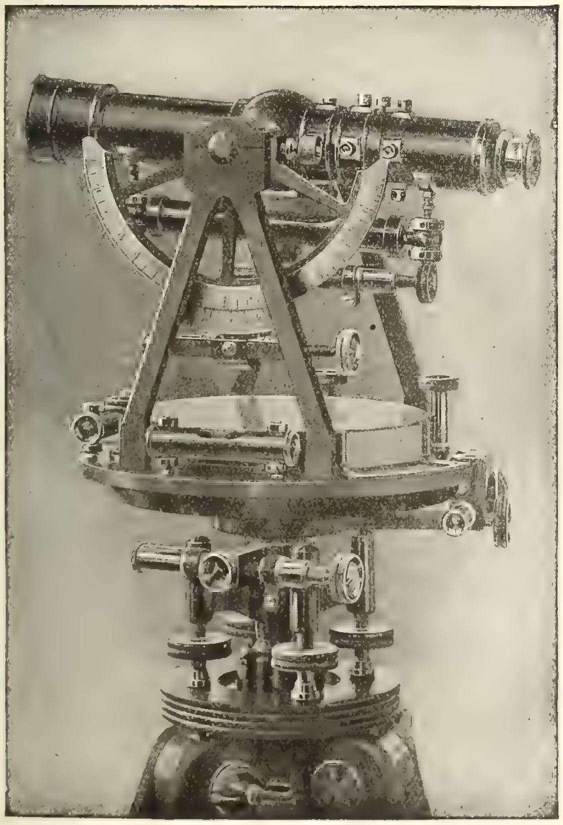

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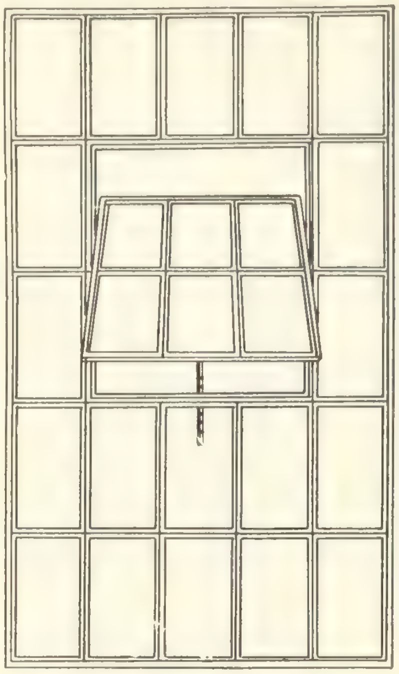

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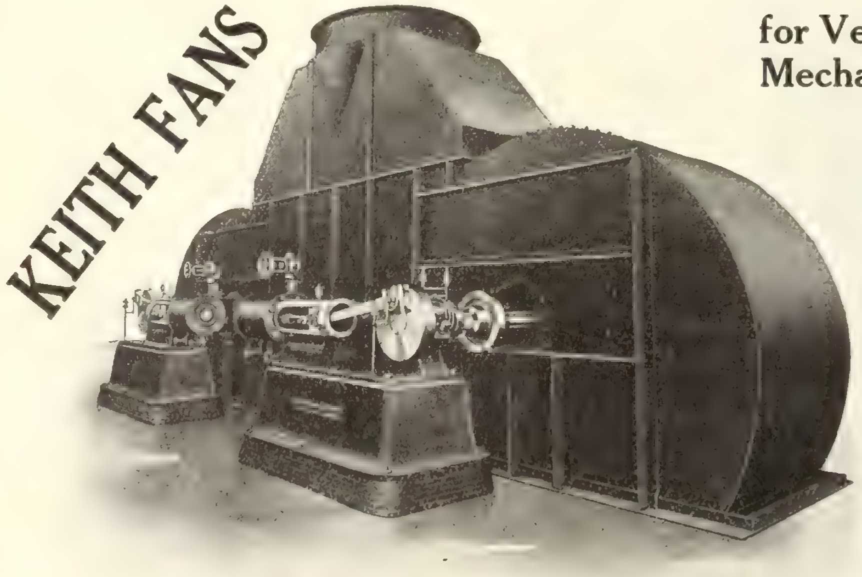

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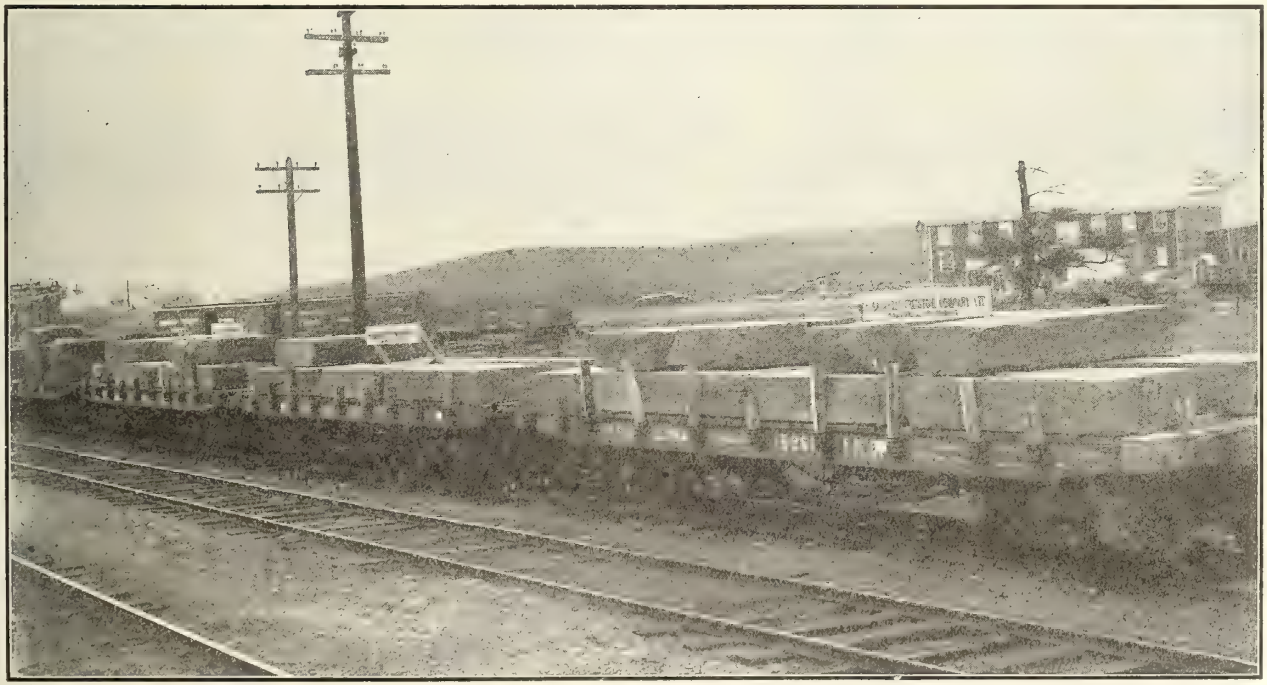

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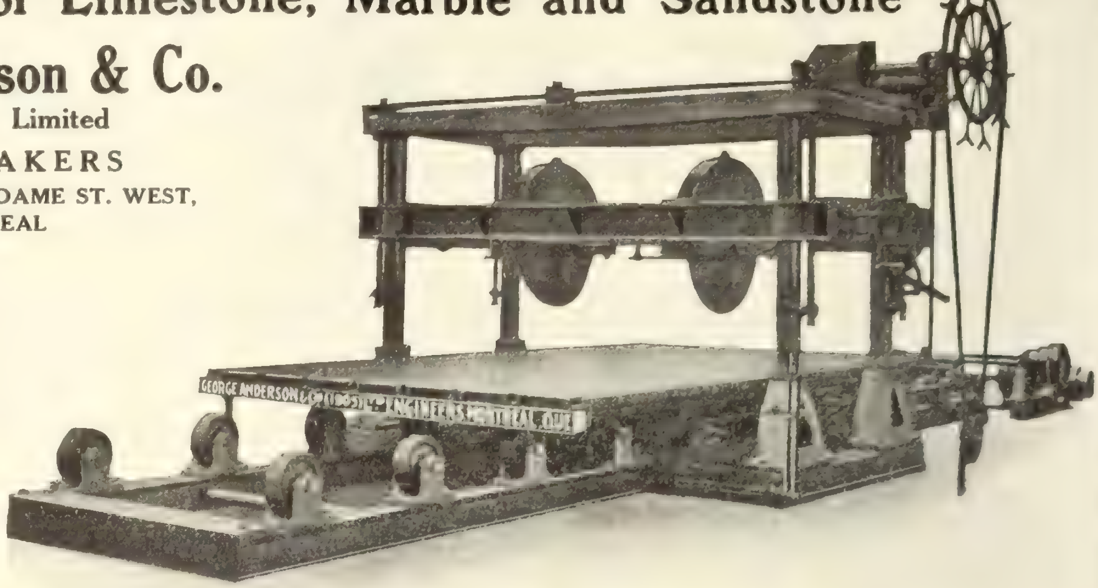

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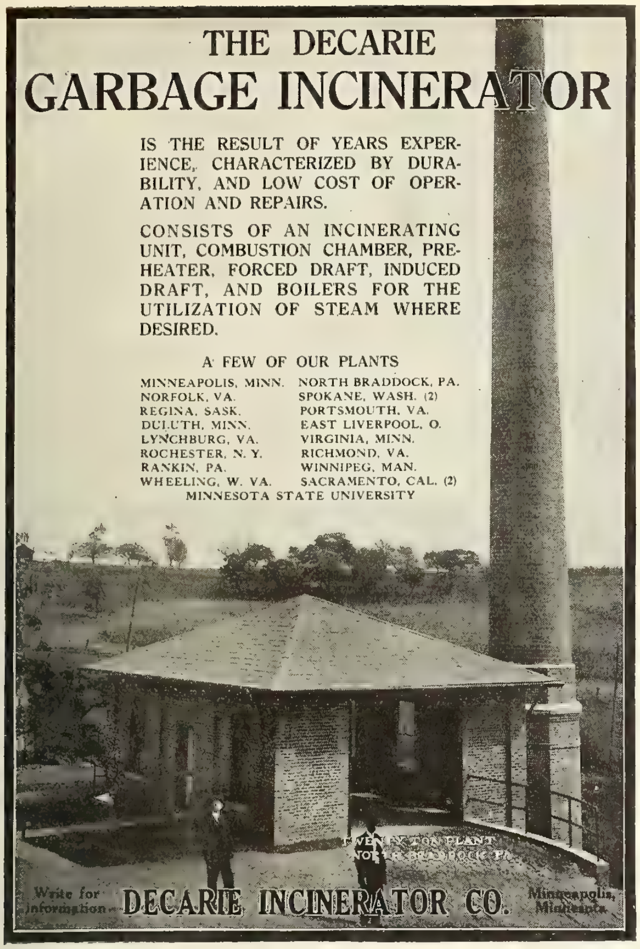

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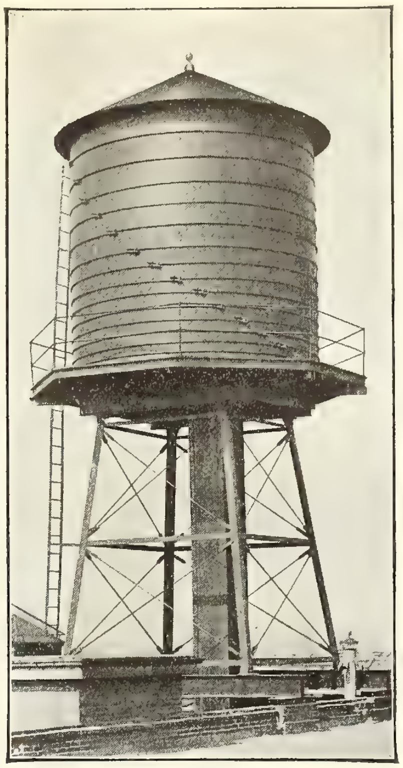

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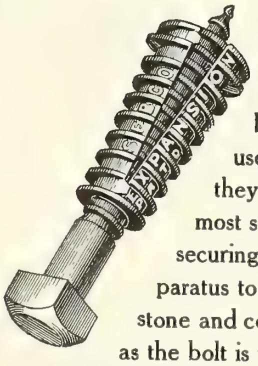

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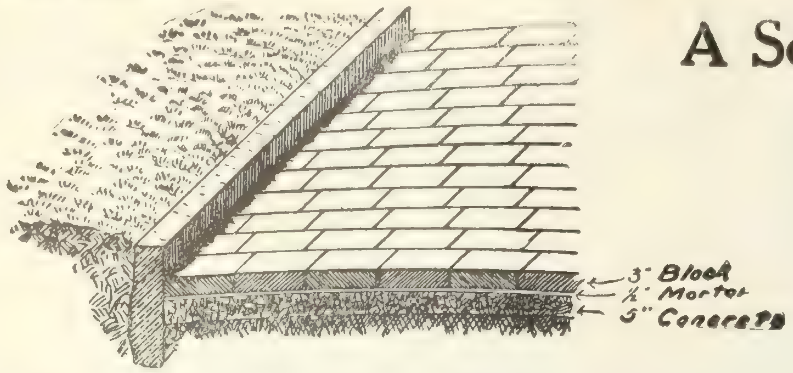

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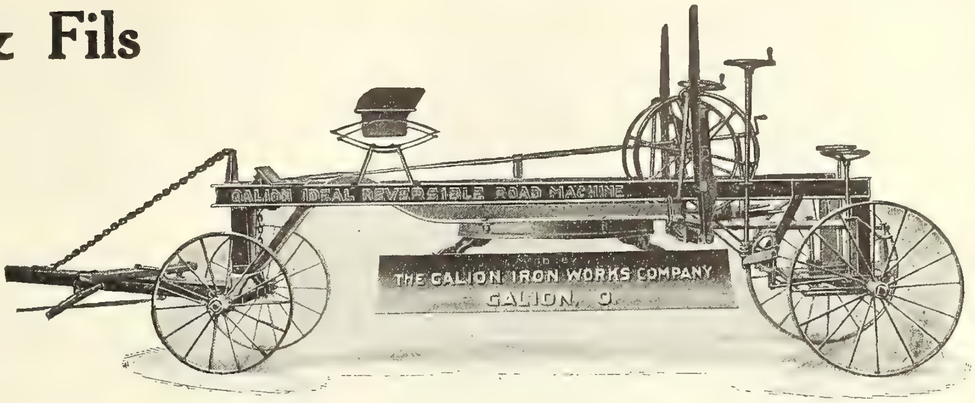
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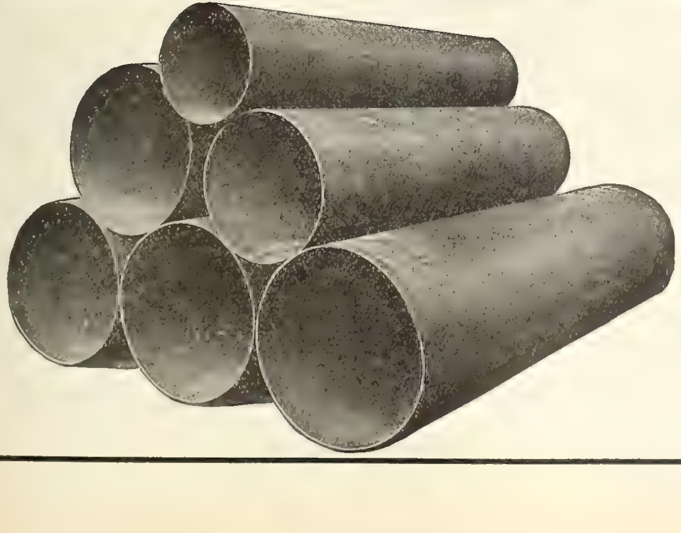

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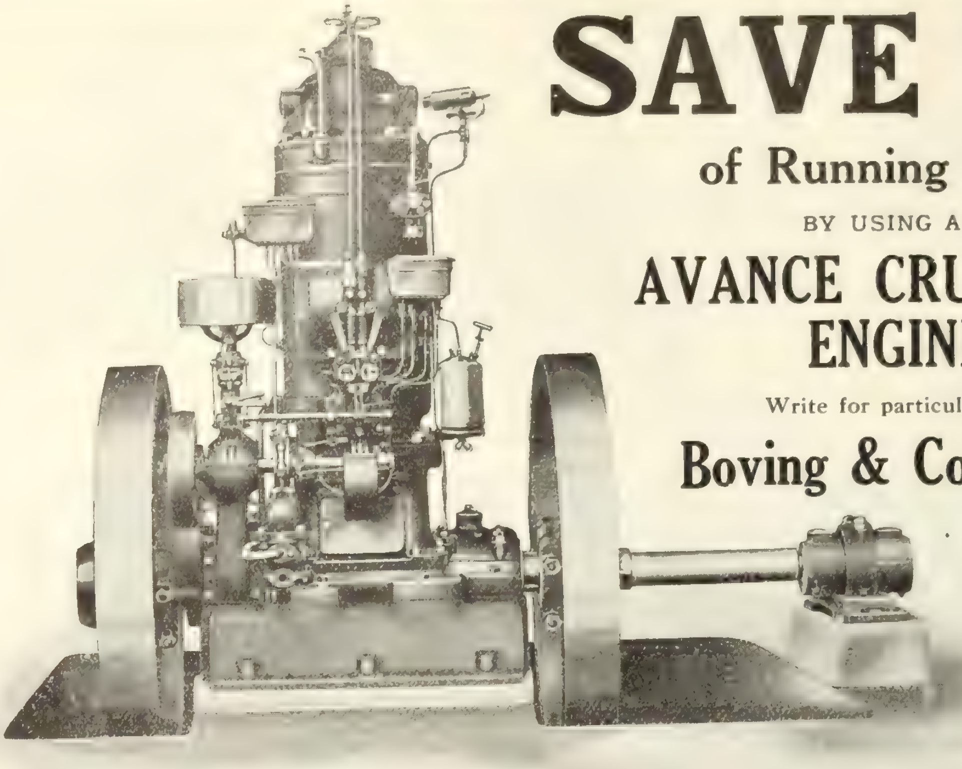

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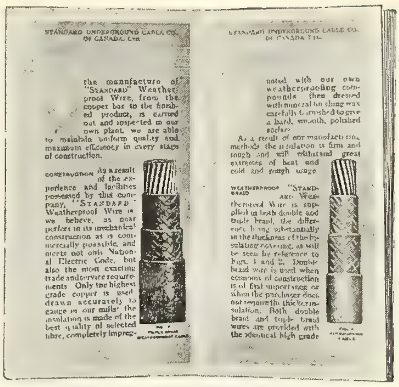

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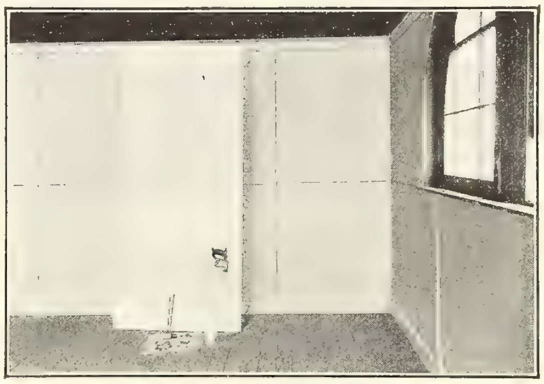

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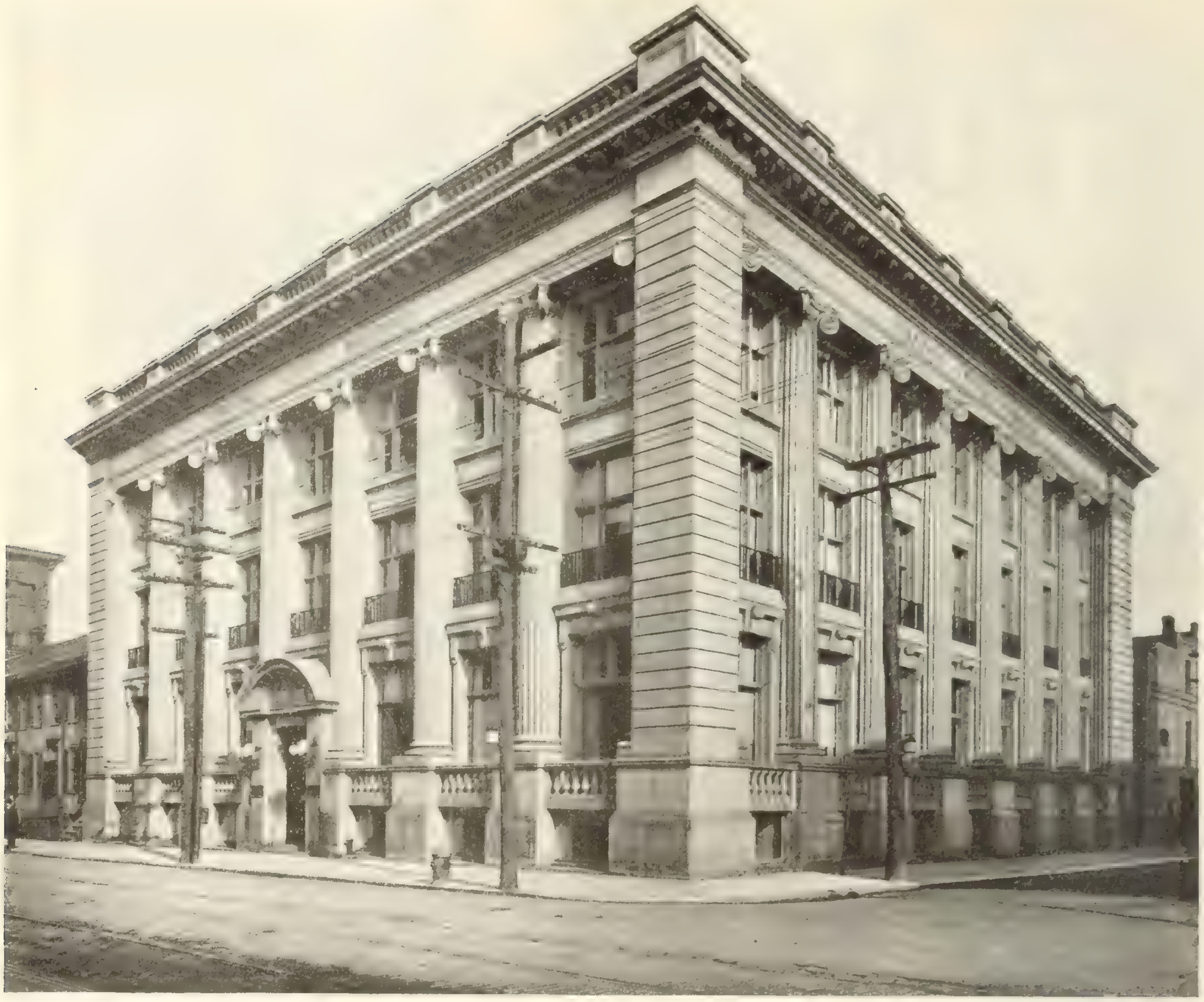

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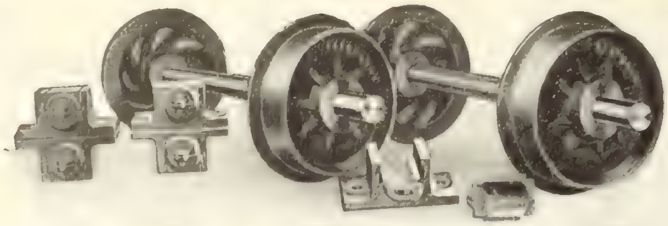

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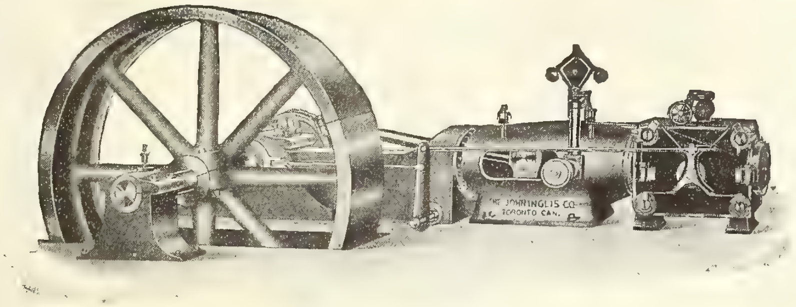
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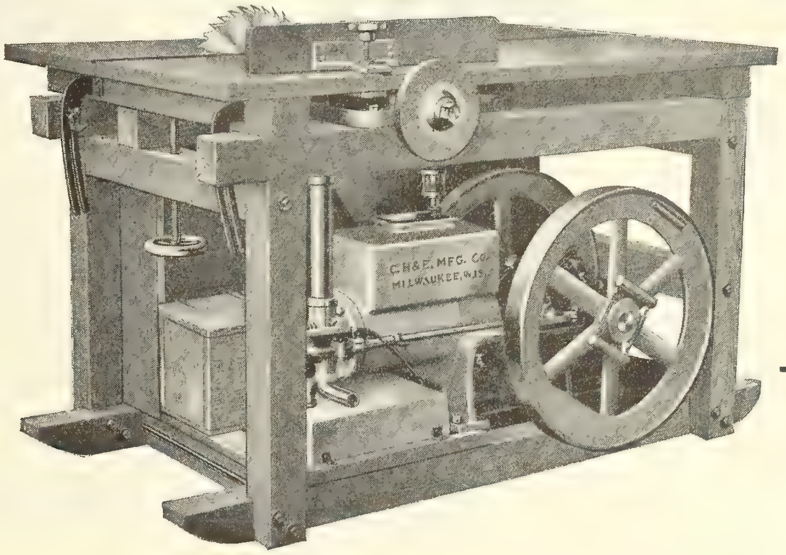

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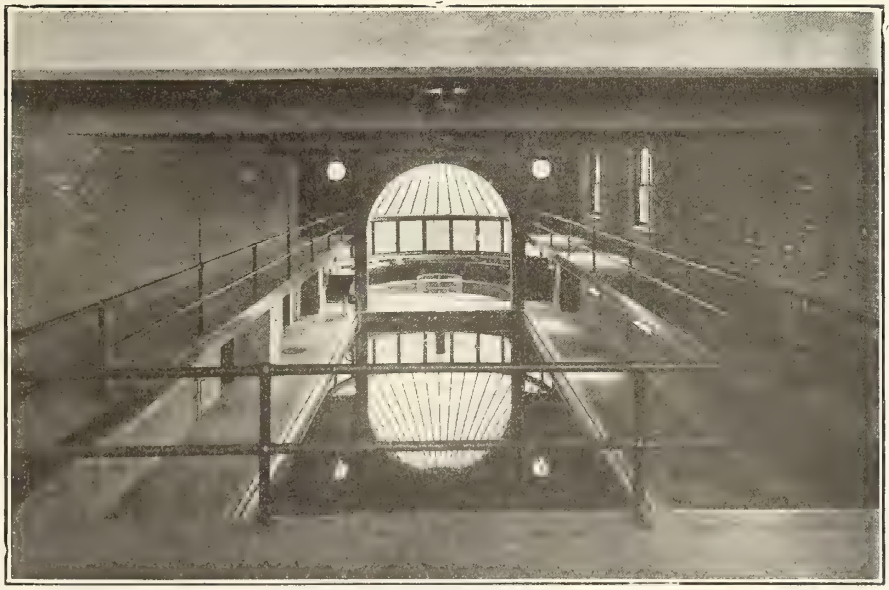

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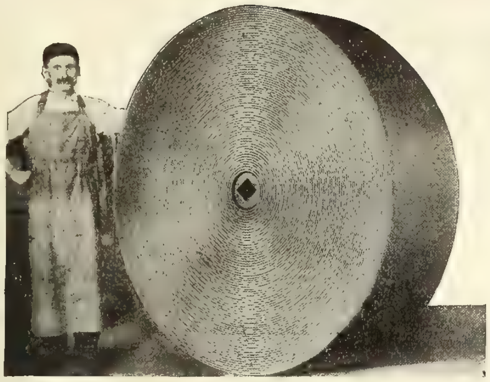

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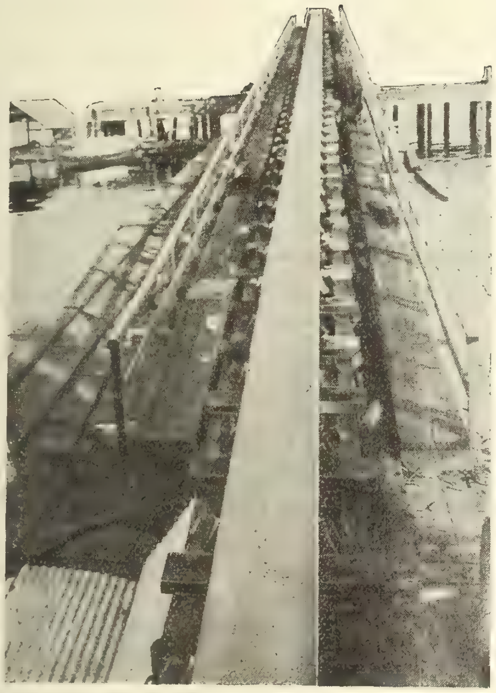

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The Building Situation

THE building permits issued in the city of Toronto and several other large cities for the month of June show a decrease in value as compared with those issued during the same month of last year. As pointed out elsewhere in this issue these decreases arise because 1912 was an extraordinary year and the first six months of 1913 is compared with an exceedingly high rate. If the amount of building indicated by the returns is looked at apart from all comparison they will be seen to represent a very substantial amount of work. It may be noted that among contractors there is manifested no alarm. Some hail the conditions as a necessary economic movement. All expect the period of retrenchment to be of short duration and look forward hopefully to a freer money circulation in the near future.

As bearing upon this feature of the situation we may quote from the speech of Sir Edmund Walker at a gathering of the Royal Colonial Institute, London, Eng. "What the people of England ought to remember is, that the series of securities sold by Canada in London during the past few years have been, taken as a whole, the best securities that have been offered by any foreign country or overseas dominion." "The point to be remembered is that the borrowing of Canada is finally determined by emigration." "Now we are forced to build whether we like it or not because of the increase in population and because of the new areas in Canada being open to settlement." "Apart from the scarcity of money—and I should say that money is not tight in Canada at any time that it is not tight in London—I know of no difference in Canada from past years except the decline in real estate speculation—a thing not to be regretted." "I am certain that the land banking of the country is perfectly secure and that such loans have been made at prices which are easily realisable from the inherent value of the property even if there were a great decline."

For those who contemplate building and who have money in hand or can command the capital, the outlook is favorable. Building material has felt already to some slight extent the effects of the restriction. The larger brick concerns contracted for their whole output early in the season and will probably go through the year without any change in price. But the newer and smaller companies have reduced their prices and are doing what has not been done in Toronto for some years. They are actually seeking to sell their product to the city contractors. Lime, crushed stone and cement are firm and likely to suffer very little change in price. Building steel shows a downward tendency. The American market for steel is dull. There is very little demand and considerable production and pig iron has declined a dollar a ton. Lumber is fairly firm. Two conditions have a tendency to keep it so. The cut last winter was light and the demand is fairly well up to the supply. If the present tariff provisions at Washington pass there will be opened a market of some importance for the Canadian output. However in response to the decline in the building trade there will probably be a slight falling off in the price.

A marked feature of the building material situation is that there is more in sight than for some time past It is more easily obtained, and while a slight decline in price might be anticipated from this condition, it does mean assuredly an economy in handling and fewer irksome and expensive delays.

The labor market is easier than it has been for some years. This again means an economy for those building under present conditions. In spite of agreements as to wages, the law of supply and demand will govern. While there may be those who will lay down their tools rather than accept a wage lower than the fixed standard, there will always be those to whom work is a necessity, and who will offer their services at a lower wage rather than go idle. Moreover, free competition in the labor market means both an increase in the quantity and improvement in the quality of the work done by the individual workman—an item to be considered in building estimates.

Furthermore, while many contractors are busy with work now under way, there are many to whom a large contract would be quite acceptable, if for nothing more than "to keep things moving." This again means an economy from the owner's standpoint.

We do not for one moment believe that there is to be a general permanent depression in the building trades of Canada. In Toronto alone, the supply of house accommodation has not overtaken the demand. With dear material, high-priced labor, abnormal land values and lack of suburban railway connection, it is impossible that the supply should keep pace with the demand. We do believe that there is a momentary check which will have a wholesome effect in producing a sounder, and more economical development.

WE regret that in the issue of July 2nd the name of Mr. H. K. G. Bamber, Inst. C.E., F.C.S., was omitted in connection with the article, "Modern Methods in the Manufacture of Portland Cement." The paper was originally read by Mr. Bamber before the Vancouver Branch of the Canadian Society of Civil Engineers.

An Important International Question

A QUESTION which may necessitate international arbitration between Canada and the Republic to the south looms up on the horizon. In 1900 the American engineers completed, at an expense of $45,000,000, the Chicago Drainage Canal, whereby the waters of Lake Michigan were admitted to the Chicago River and the sewage of the city carried by this means through the Des Plaines and Illinois rivers to the Mississippi. It was feared at the time that the levels of the Great Lakes would be affected. A constantly increasing supply of water has been taken with the result that the lake levels have been lowered.

American shipping interests extend from Lake Erie to Lake Michigan and Lake Superior while those of Canada extend from Lake Superior to the Atlantic. An International Waterways Commission was appointed to investigate. The Commission has reported to both governments that the engineering feat of building a weir across the Niagara is possible; that the weir would raise the levels of Lake Erie; that the building of the weir would not affect Lake Ontario or the St. Lawrence.

The proposal is to build a five foot compensating ridge where the Chippewa River joins the Niagara. Such a work would raise the waters of Lake Erie and the remaining western lakes and satisfy American and Canadian shippers from Lake Erie westward. But how are the levels of Lake Ontario and the St. Lawrence to be raised and maintained? What assurance is there that the harbors at Montreal and Toronto will be uninjured?

The Canadian Government is spending $50,000,000 to open through the Great Lakes system a channel for twenty-two foot ships. In view of this expenditure and in view of the importance of the Canadian interests in this great internal highway it is important to watch carefully every step taken and not to permit the improvement of one part of the system at the expense of the other.

Editorial Comment

THE charge against Rutherford Cumming, Frederick L. Richardson and Solomon Thompson, of conspiring to defraud the city by making excessive charges for repairs to the water works' intake pipe was dismised by Judge Morgan recently. His Honor stated that the repairing of the intake was an emergency and rush job that the contractors had to be ready at any time to take advantage of favorable weather conditions. They were to receive 20 per cent. of the cost of the work, "whatever that phrase meant to the party drawing the contract." The contractors had interpreted the contract as referring not only to money expended on material and labor for work actually done on the intake pipe, but also to losses sustained through keeping gangs always ready for work.

* * *

A PERMANENT auxiliary plant to serve the waterworks, pumping, filtration, and sewage disposal plants in the case of interruption in the service for the transmission lines from Niagara is to be established at Toronto. The joint report of Chief Enginter Gaby, of the Provincial Commission, and General Manager Cousins, of the Toronto system, stated that 14,000 h.p. was required for the civic plants. The report favored the installation of a generating plant within the city operated by steam, gas or oil engines rather than depending upon the system of the allied electric companies.

* * *

THE American and British Claims Tribunal which recently completed its initial sessions at Washington and Ottawa has issued judgment on four cases. This Tribunal was organized for the purpose of settling pending claims against the British and American Governments. Some of the claims date back many years. Three of the decisions given were in favor of United States Government. The claim of William Hardman, British subject, who lost property in Cuba during the Spanish-American war, was dismissed, as were also the claim for $4 a thousand on timber purchased by the War Department from a contractor for building a fort in Alaska and the claim for compensation for the use of the steamer Robert King for transporting coal for the Navy Department. The British claimant was awarded demurrage amounting to $150 on account of a collision between a British steamer and a United States army transport.

* * *

THE vigilant Medical Health Officer of Toronto, Dr. Hastings, is issuing a series of regulations providing for proper sanitary precautions on the part of the street railway authorities. To provide against overloading, the regulations state that the cars shall carry not more than their seating capacity plus two-fifths of the seating capacity and five more for the rear platform. In a normal car this makes the total of sixty-one. In the open summer cars no passengers are to be carried between the seats. All straps are to be celluloid or composition. The cushions are to be of such material as may be readily cleaned and all cars in use are to be daily washed and the cushions cleaned with a vacuum cleaner. The heating and ventilation is to be under the supervision of the Medical Health Officer. The company itself in the past has tried to enforce somewhat similar regulations in regard to overloading but has failed. It remains to be seen whether the Medical Health Department will be able to make its regulations effective. The hearty co-operation of the people would greatly simplify matters.

Under Lord Kitchener's economic administration, ity. This discharge is to be led through a power the great Assouan dam in Egypt is to be utilized for reservoir passes through the sluices at a high veloc- power. During five months of the year water from the house for the purpose of developing an electric current. It is estimated that a total of 150,000 h.p. can be obtained. The power is to be used in the manufacture of chemical fertilizers by the fixation of nitrogen from the atmosphere. Over three million dollars was spent in Egypt last year for manufactured fertilizers.

Recent tests for electrolysis in water mains at Seattle, Wash., showed, it is said, the existence of an electrical current from trolley wires sufficient to furnish power to six 32-candle lamps. The city has filed a claim for $8,000 damages by electrolysis against the street railway company, which, it is said, has been denied. Double trolley wires have been suggested by Superintendent L. B. Youngs of the Water Department to prevent further damage.

Third International Road Congress*

Text of Resolutions Adopted, with Comments Thereon—Road Construction—Lighting—Traffic Control—Functions of Authorities—Finance Problems

(Staff article direct from the Editor)

At the closing meeting of the Congress, held on June 27, the resolutions proposed by the various sections were read in their order in the three official languages of the Congress and voted upon with due regard to the amendments proposed. As we have said, these resolutions had reference to the "questions" only and not to the "communications." We give now the final text of the resolutions as adopted by the Congress.

1st Question—Planning of New Streets and Roads

1. As a general principle, it is better that new main roads be constructed to pass outside than through town, and, where an existing main road passing through a town is unsatisfactory for through traffic, it is often better that, in preference to widening an existing narrow main road through the centre of a town, new roads should be planned according to the principles of the science of town planning.

2. Gradients on new roads should be as easy as possible having regard to the physical character of the country through which they pass and they should be easier where there are curves, trams, or a preponderance of heavy traffic.

3. The radii of curves in roads used by fast traffic should, where practicable, provide the best possible (and an unobstructed) view, and where this is not possible, the curve being too short a radius, means should be provided whereby the approach thereto is in some way clearly indicated.

4. Except where it is possible to provide special reserved spaces, tram tracks are best placed in the centre of the roads, and where so placed it is desirable to provide space on either side for two tracks for vehicles.

5. The main traffic roads should be so designed that spaces are provided for tram tracks, fast and slow traffic, and standing vehicles; and in such a way that they can proceed without unduly intermixing. In fixing building lines along what may ultimately become main roads, regard should be paid to ultimate requirements. Adequate space should be provided between the buildings, and powers for enforcing this should be held by all authorities who decide the widths of roads.

6. The planning of main road communication outside towns should be at once undertaken; it is a matter of national importance in regard to which some initiative should rest with a Central State Authority, and the action of Local Authorities should to some extent be regulated or supervised by Central State Authorities.

There is nothing to cavil at in these really harmless resolutions. We all know that "gradient should be as easy as possible having regard to the physical character of the country," and the advantage of wide roads, sufficient for the traffic, is apparent. It has to be remembered that the London Congress was run largely by the motor interest; hence perhaps the recommendation that main roads be carried outside rather than through towns. A main road, by leaving the track of civilization, would surely cease to be a main road, and would form rather a by-pass road, on which of course motor traffic could make its own pace. Opinions as to central or side tram tracks will differ, and no resolution of the Congress can, we fear, do much towards a settlement of the question. Certainly the side track appears more suitable to a concave than a convex road, for then the slow traffic would naturally gravitate to the centre.

2nd Question—Types of Surfacing to be adopted on Bridges, Viaducts, etc.

1. The choice of road surfacing for bridges depends on the nature and intensity of the traffic, the local conditions, such as permissible first cost, kinds of material readily available, and climate. For light bridges the choice is largely influenced by the weight of the surfacing. Public safety and convenience should be first regarded rather than questions of comparative cost.

2. On short bridges in town or country, it is desirable that the surfacing should be the same as that on the adjoining streets or roads.

3. In forming the roadway on bridges, special care should be taken to secure proper drainage, and to prevent the harmful percolation of water. With longitudinal gradients of at least 1 in 50, the cross section of the surface may be made nearly flat and the dead load thus reduced.

4. As a general rule, the surfacing a bridge should be waterproof, capable of resistance to wear, durable, and of a weight appropriate to the structure of the bridge; it should also be as smooth as possible without being slippery.

5. Plank surfacing on bridges is light, and its first cost is low. Its cost of maintenance is, however, excessive, except where the traffic is light. Its extreme liability to damage by fire is a serious disadvantage. It should not be adopted, except in remote districts in which there is an abundance of cheap timber, and where a more desirable form of surfacing is not easily obtainable. Single plank floors are only suitable for very light traffic. For moderate or heavy traffic, two layers of planking, the lower of which is creosoted or otherwise protected from rapid decay, should be used.

6. Macadam, or ordinary broken stone surfacing, on timber planking, is not always satisfactory on account of its great weight and its permeability. Macadam is, however, quite satisfactory for massive bridges in rural districts, if the substructure has a proper damp course.

7. Macadam, bound with tar, or other waterproof and elastic material, is useful and economical for the surfacing of rural bridges with moderate traffic, when the spans are short or the structure is massive.

8. Wood block paving, 3 to 5 inches thick, is an ideal surfacing for bridges in most cases. It is light and durable and can be laid on concrete, or, when weight must be minimised, on a timber sub-floor, which should be creosoted. Special care should be taken in the selection, treatment and laying of wood blocks for bridge paving, to avoid troubles due to expansion and contraction of the blocks or of the metal structure.

9. Asphalt, in various forms, is an excellent surfacing material for bridges with easy gradients, on which the traffic is not confined to definite lines or very heavy.

10. Stone paving, carried out either with ordinary hand-dressed setts or with small setts (Durax; Kleinpflaster), laid on concrete and bound with cement or pitch, makes an excellent and economical surfacing for bridges with heavy traffic, However, it is only suitable in cases where questions of the

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*Concluding portion of report published in our last issue.

weight of the surfacing or of noise are of no importance. The thickness of the layer of sand interposed between the sets and the foundation will be decided in the same way as with an ordinary carriage-way, in town or country, as the case may be.

11. For movable bridges, and for non-rigid suspension bridges, the surfacing should be light and easy to attach to the bridge platform. The trials made in France and Belgium with old mine cables, or other fibrous substances of even less cost, and with such materials impregnated with tarry, bituminous or asphaltic materials should be encouraged.

These resolutions are of quite a different type to those under the previous question, and although there is much of the obvious in them they are not without their value. M. Verriere, Engineer of the Ponts et Chaussees, Paris, said in his paper: "The various types of surfacing to be employed on bridges do not differ, in the main, from those which are usually employed for other positions of the roadway," and this is so to a great extent; but, as he also pointed out, the question of lightness, waterproofing quality, depth and elasticity must also be taken into consideration in selecting a material for bridge surfacing.

3rd Question—Construction of Macadamised Roads bound with Tarry, Bituminous, or Asphaltic Materials

GENERAL CONCLUSIONS

By the use of bituminous, including tarry or asphaltic binders, we may obtain a number of different forms of road crust, which may be employed with advantage, according to the various conditions of the road as regards traffic, locality, and climate.

The exact value and duration of life of these various road crusts, taking into account traffic, climatic conditions, and the methods of construction, remain to be determined.

For this purpose it is advisable to draw up a uniform system of tests, measurements and records, under the following headings:—

1. Physical and local conditions. (Plans, cross-section, slopes, camber, foundations, subsoil.)

2. Materials employed, petrological analysis, dimensions, composition of the binding agent.

2a. Method of construction, date of construction.

3. Census of traffic on the section under review.

4. Climatic conditions affecting the road.

5. Periodical measurement of wear.

6. Periodical examination of the state of the road crust.

7. Actual cost of the road crust—(a) as regards cost of construction. (b) as regards maintenance cost.

The standard form in which the information is to be furnished will be drawn up by the Permanent Commission.

PARTICULAR CONCLUSIONS

I. Foundation and drainage.

Confirming the conclusions adopted in 1910 by the 2nd Congress (Brussels, 2 Question), which called attention to the advantages of a dry foundation and a sound subsoil, the Congress especially insists upon the great importance of efficient foundations in the case of road crusts bound with bituminous (including tarry or asphaltic binders) for the following reasons:—

(1) The road crust being expensive, it is important to give it a base which will increase its life.

(2) As the weight, speed and intensity of the traffic continually tend to increase on roads considered worthy of such a crust, it is best to provide a foundation which has been so constructed as to secure for the crust the best possible conditions of resistance to wear.

II. Dimensions and shape of metalling.

(1) When an ordinary macadamised road crust is constructed with a view to being tar-sprayed, it should be constructed of hard metal, with sharp edges, and broken as nearly as possible to a cube of the dimensions of from 4 to 6 c/m.

(2) In the case of bituminous including tarry or asphaltic macadam, carried out by the mixing process, the dimensions of the metal may be so selected and graded as to form a compact road crust with the fewest possible voids. The dimensions of the largest metal may vary according to the nature of the stone and of the traffic. When the process of construction employed requires more than one layer of material, the upper layer or wearing crust may be formed of smaller metal.

(3) In respect of bituminous (including tarry or asphaltic) road crusts constructed by the penetration process, the trials and tests now being carried out in various countries should be continued, taking care only to employ metal of as cubical a shape as possible, and with sharp edges, at any rate for the portion of the road crust nearest the surface.

(4) It is understood that further experiments will also be carried out in the use of other methods, and especially those referred to in paragraphs (1) and (2).

III. Employment of partially used metal.

By carefully eliminating all particles of mud and organic matter, it is possible to successfully make use of partially worn materials, on condition that they are not employed for the surface of the road crust.

IV. Relative importance of patching.

It is agreed that it is absolutely necessary to carry out repairs, in the case of all bituminous (including tarry and asphaltic) road crusts, immediately the necessity for them arises.

V. Permissible wear.

The complete renewal rendered necessary by wear must be carried out immediately the depth of the road crust is below a given limit of safety, or when its waterproofing qualities have become so poor that the road will unduly suffer from climatic conditions.

VI. Various means of employing tarry, bituminous and asphaltic materials.

In using these materials, both in the penetration method and the mixing method:—

(a) It is preferable to use dry stone in order that it may adhere well to the binder. In the mixing method the stone must always be dry, and if necessary it must be heated.

(b) One must never lay a top crust upon a soft or damp foundation. One should preferably carry out the work in fine weather.

(c) One must never employ too much binder, but only a sufficient quantity to bind the portion of the road which is being rolled.

(d) One must never employ road rollers which are too heavy.

VII. Tests and chemical analysis.

The advantages of analyses and methodical laboratory tests, and their necessity in the case of bituminous binders, are unanimously recognized.

It would be of advantage to obtain uniformity—

(1) As regards the specification of the principal characteristics of these binders.

(2) As regards the methods of testing for drawing up these specifications. The Permanent International Commission will be entrusted with the work of enquiring into the best way of standardizing the above.

VIII. Climatic effects.

It appears to be generally agreed that certain tarry bituminous or asphaltic road crusts (as is also usually the case with all smooth and waterproof road surfaces) may become slippery under certain conditions of weather.

This may be remedied by strewing the surface with coarse sharp sand; and in most cases a good cleansing of the surface will usually prevent the carriage-way becoming slippery.

IX. Effects on public health, etc.

Sufficient information is now available to enable engineers to select and specify bituminous binders which will have no prejudicial effect upon public health, fish life, or vegetation; but which, on the contrary, will conduce to conditions of considerable hygienic advantage.

X. Cleansing and watering.

It is recognized that carriageways properly treated with bituminous (including tarry or asphaltic) materials require less sweeping and watering than ordinary water-bound macadamized roads, and that they allow of considerable economy being effected under this head.

The meeting puts forward the following additional proposal: That an International Technical Committee should be appointed by the Permanent International Commission in order to study a standard method of obtaining information and data upon materials, physical conditions, local conditions, methods of construction, terminology and other points concerning macadam bound with tarry, bituminous or asphaltic binders.

The report of the Committee should, after examination by the Permanent Commission, be presented to a next Congress.

There is nothing to which we could take exception in the foregoing. Precise information on the subject is badly needed and the preparation of standard forms for international use would be a useful work. The advantages too of analyses and methodical laboratory tests are apparent, and it is to be hoped that the Permanent International Commission will bring about the sadly-needed uniformity in these matters. Possibly the Munich Congress will be enabled to discuss the report of the proposed International Technical Committee. It is well to realise that roads and road surfacings of the nature of those under discussion are as yet but in their infancy.

4th Question—Wood Paving

1. Where gradients permit, wood block pavement is very suitable for streets where the traffic is great, but is not of the exceptionally heavy character usually existing on streets near docks or similar centres of industrial traffic. It should be used where a noiseless pavement is desirable.

It is of great importance that a concrete foundation should be laid of sufficient strength to carry the traffic passing over the pavement.

2. Great care is necessary in the selection of the proper timber for the purpose, and all soft wood blocks should be thoroughly impregnated with a well proved preservative before being laid.

3. In view of the varying results given by wood pavements, according to local circumstances, it is desirable that further investigations and laboratory experiments should be carried out in connection with the selection of the timber and of the impregnating preservative.

4. Every precaution should be taken in laying the blocks to prevent, so far as possible, the entry of water through the joints.

4a. Hard woods give varying results according to local circumstances, and it does not appear desirable to recommend them for roads with intense traffic in large cities, unless some means are devised to effectively prevent the rapid destruction of the joints and the resulting destructive effect on the concrete below. If these woods are employed it is desirable not only to prevent the percolation of water through the joints to the foundation, but also to consolidate the blocks as far as possible, so that they may not become rounded at the edges.

Soft woods obtained from suitable kinds of trees, and especially from resinous species, are equally suitable for roads with a comparatively heavy and intense traffic as well as for roads with a light and infrequent traffic. In the latter, however, the blocks are liable to rot if they have not been suitably pickled. It is also desirable to make the joints as small and watertight as possible. On the other hand, their comparatively rapid wear on roads with great traffic should encourage one to make exhaustive investigations into the best means of treating them, so as to increase their strength without prejudice to their elasticity.

5. Subject to certain precautions, such as impregnating of the wood, waterproofing of the joints and surface, frequent cleaning of the roadway, etc., there is no objection to wood pavement from the sanitary point of view.

6. The spreading of gritting is necessary under certain conditions and in certain weather (especially on hard wood paving) to prevent the surface becoming slippery, but the gritting should be done with suitable small gravel chippings or sharp sand, so as to avoid, as far as possible, any injury to rubber tires.

Here again, we are reminded of the necessity for further investigations and laboratory experiments, and we recognize to the full the importance of these as regards impregnating preservatives. As to the selection of the timber, that is largely a local matter. Hardwood pavements are largely used in Australia, with the very best of results; but then Australia (or at least Australasia) may be called the home of the hard woods. Other countries rich in hard woods have obtained similar results, while soft wood countries lean towards soft wood pavings. When importation becomes necessary, the fight between hard and soft wood becomes most keen, and no finality can be obtained without much further investigation and laboratory experimentation.

5th Question—Methods of Lighting

I. For the purposes of a general determination of methods of lighting, highways may conveniently be divided into three classes as follows:—

(1) Important streets in cities, towns or other urban areas in which the traffic after dark is considerable in volume;

(2) Important suburban roads in the vicinity of large towns;

(3) Rural roads in open country; and having regard to modern conditions of traffic it is essential that adequate lighting by means of fixed lights should be provided in classes 1 and 2.

II. As a general principle in the lighting of all highways which require to be lighted by means of fixed lights, the method of lighting to be adopted should be such as will provide an illumination as uniform and free from glare as possible. The amount of illumination and the position of lamps must be determined with reference to local circumstances.

III. It would be impracticable to light rural roads in open country generally by similar methods to those adopted in urban streets or suburban roads, and the lighting of vehicles running or standing on rural roads at night is therefore of the highest importance.

IV. Every vehicle whether standing or moving should carry or show a light of sufficient power at night which can, except when specially unauthorized, be seen from the rear as well as from the front of the vehicle.

(2) Every motor car must carry after nightfall, two

lighted lamps in front, and one at the back; if it is able to move at a high speed it must be fitted in front with a headlight of sufficient illuminating power to light up the road or path for at least 50 yards to the front. In inhabited places where the ordinary lighting is sufficient to allow motorists to see their way and to be easily seen, the light of the headlights must be limited to that of the ordinary lamp.

V. It is desirable that all obstacles across a road such as gates, and particularly gates at railway level crossings, should be painted white and in other colours in alternate parts, and illuminated by fixed lights which are lighted at dusk.

(2) It is desirable to paint with white paint or indicate by some other method all danger signal posts, direction posts and other posts, milestones, wheel kerbs, bridge abutments, etc., or other special features, the indication of which would aid travellers, or conduce to the safety and convenience of the traffic.

VI. One and the same colour should be universally adopted as the colour for danger signals.

VII. It is desirable that each government should do away as soon as possible with coloured lights on automobiles.

VIII. The Congress expresses the wish that regulations should be made to compel drivers of herds of cattle to make their presence known at night.

Three clauses call for a word of comment here. In IV. (2) mention is made of motor cars that are able to move at a high speed and it is recommended that these be fitted with a correspondingly far-reaching light. It would surely be better to put some check on these high speed machines than to encourage their speed by allowing them to use lamps which dazzle and confuse other road users. Resolution VII. advocates that coloured lights on automobiles should be done away with. Surely this cannot mean that both head and rear light are to be white! Resolution VIII. is so vague that comment would serve no purpose. Local conditions must govern it entirely. We note that there were two dissentients to its adoption.

6th Question—Observations noted since 1908 as to the various causes of Wear and of Deterioration of Roadways.

1. Weather conditions are amongst the most powerful influences which cause deterioration of roads, and the destructive effect of weather can be minimized by effective waterproofing of the road surface, with suitable drainage for the foundation.

2. Any considerable volume of traffic consisting of either heavy motor vehicles or high speed light motor cars has a seriously damaging effect on waterbound macadam roads. The damage caused is effected by the balancing of the motor; the ratio between propelling power and adhesive weight; the weight of unsprung portions of the motor; the progressivity of action of the brakes; the system of springing; the type of tires employed, the diameter of the wheels, the width of the rims, variation of speed and adherence, and other factors.

3. The damaging effect of heavy motor vehicles can be minimized by the use of wheels of large diameter; tires of a width properly adapted to the weight of the axle load; rubber or elastic tires and suitable springs; and all reasonable means of reducing the damage to roads caused by such vehicles should be enforced.

4. Light motor car traffic does not cause serious or exceptional wear or damage in the case of properly made macadam roads which have been properly treated or bound with tarry, bituminous or asphaltic materials, except in sharp curves.

As regards horse drawn vehicles it is desirable also to study the relations between load, width of rims and diameter of wheels and more especially the system of shoeing horses. It is also necessary that power should be given to local authorities to prevent the deposit of refuse from the fields and earth upon the roadway by the wheels of agricultural carts.

5. There is still a great lack of precise information in regard to the various causes of wear and deterioration of roadways, and it is desirable to collect more information compiled on carefully devised scientific methods standardized as far as possible for the purposes of comparison, and to make further systematic study of these causes.

The International Permanent Commission is charged with the preparation of a programme of observations, studies and experiments.

7th Question—Regulations for Fast and Slow Traffic on Roads.

1. That all regulations for the control of road traffic should be based on the principle of allowing the speed practicable for each different kind of vehicle consistent with public safety, general convenience, and the normal wear of the road.

2. That regulations for the conduct of fast and slow traffic should be as few and simple as possible and should be such as can and ought to be universally adhered to and enforced.

3. That in all large cities there should be a Traffic Authority on whom should be charged the duty of studying and dealing with street traffic problems, the powers of such authority and the co-ordination of such powers with those of other public authorities being matters of detail which must be settled by public authorities on consideration of the circumstances and conditions of each large city.

4. That there should be ample provision of traffic controllers (such as the police in London) with adequate powers to regulate the traffic, not only at congested points, but throughout the course of crowded streets.

5. That having regard to the increased danger which is necessarily created by the conditions of modern traffic it is important that drivers should be carefully and systematically trained, and that children should be specially taught how to provide against the dangers of the road.

6. That except where local circumstances render it absolutely necessary, no obstructions, such as lamp-posts, tramway standards, etc., should be placed in the centre of a road, except necessary refuges for pedestrians crossing.

7. No obstruction of the public highway should be permitted either by vehicles standing unreasonably, or travelling at an obstructing speed, or by things placed on the highway. Exception must, however, be made for depots required for the work of maintenance or repair of the road, or for work being carried out by duly authorized and competent authorities, but in every case, all necessary steps must be taken to ensure the safety of traffic.

8. Regulations for roads and traffic must aim at defining the rights, duties, and responsibilities for each kind of traffic, in order to avoid the causes of accidents and damage and to ensure the maximum of order and liberty.

We cordially agree with the establishment of a traffic authority in all large cities, so long as such authority takes seriously to heart recommendation 2. Regulations to be of any use must be simple and few, and none should be made that cannot be rigidly enforced. Citizens have rights as well as duties, and local authorities are apt to forget this. The last words in recommendation 8 are among the most valuable: "to ensure the maximum of order and liberty." The London police certainly deserve the reference made to them as "traffic controllers." We cannot quite agree with recommendation 6. Central lamp standards serve a useful purpose in keeping the two streams of traffic apart. That an isolated unlighted obstruction is a danger goes without saying, and these should certainly not be allowed.

8th Question—Authorities in charge of the Construction and Maintenance of Roads. Functions of Central Authorities and Local Authorities.

1. The system of road administration in any country must be in harmony with the general system of government prevailing in that country, and the political genius of its people. It is impossible, therefore, to lay down any general rule of universal application as to the extent to which the road organization of any country should be centralized or decentralized.

2. A principle that can be laid down as to universal application is, that the unit of highway administration shall be sufficiently large and command sufficient resources to employ and adequately remunerate a competent staff.

9th Question—Finance of the Construction and Upkeep of Roads, Provision of Revenues.

1. The expenditure on the maintenance and improvement of—

(a) the roads which serve as main routes of communication between important places in any country, or

(b) roads which are used mainly by long distance traffic; unless such expenditure is borne wholly out of the National Revenues under a system of State Administration of roads (which system is practicable and suitable in the case of some roads in some countries) should be mainly paid for out of National Revenues, whether or not such roads are locally administered and maintained, subject, where local administration prevails, to the supervision of a central government authority both as to efficiency and expenditure.

2. It is desirable to abolish, so far as possible, all tolls on public roads, but it is equitable that vehicles which, on account of their weight or weight combined with speed or any other exceptional circumstances connected with either the vehicle or use of the road, cause special damage to roads beyond the wear and tear of the ordinary traffic of any district, should be subject to special taxation the proceeds of which should be earmarked for expenditure on roads.

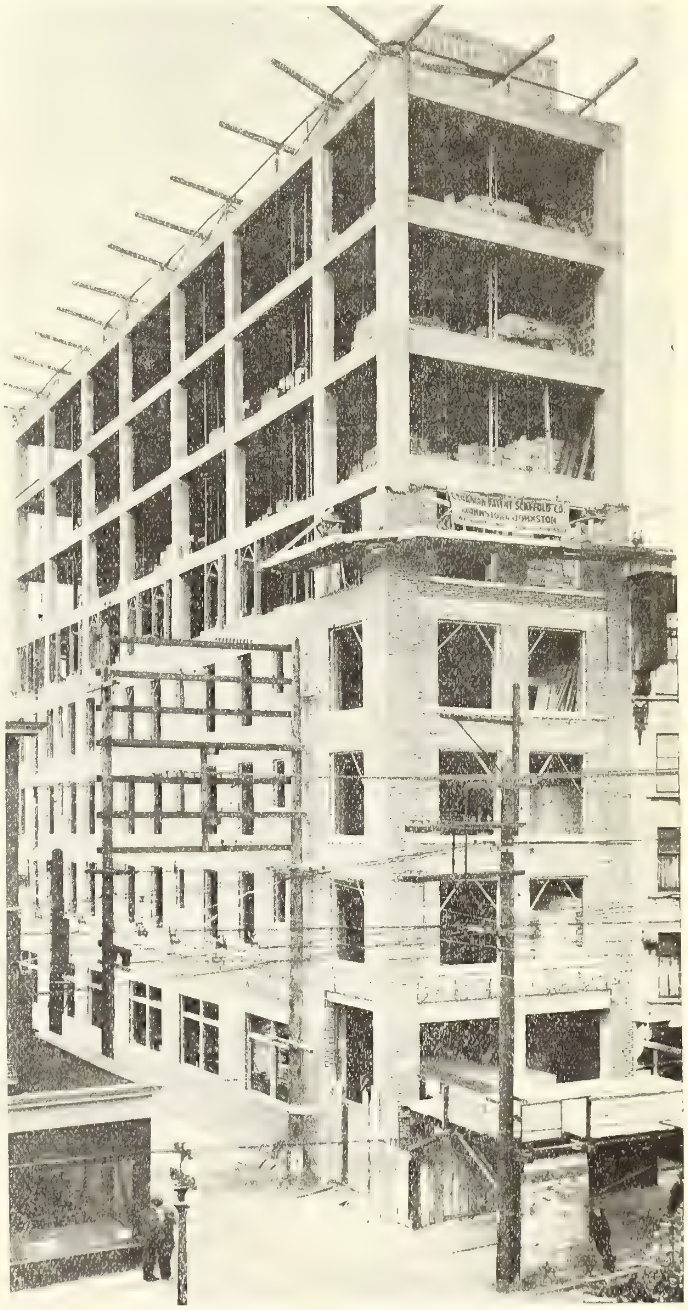
3. Borrowing money for new road construction and for the periodic renewal of the surface coating of a road is consistent with sound financial principles provided that the loan period in the case of loans for renewals, is kept well within the life of the surface coating.

We are exercised in our minds as to the wisdom of a "central government authority" for roads of any class, but the matter is too big a one to be dealt with here and we say no more for the present. With recommendations 2 and 3 we are quite in agreement.

New Vancouver Hotel

The accompanying view shows construction work at an advanced stage on the new Empress Hotel building which is located in the 200 block, Hastings street east, Vancouver. The dimensions of this structure are 25 x 132 feet, and the height is eight storeys with full basement. Reinforced concrete on a skeleton frame and long slab span construction are being used, the spans of the slabs varying from 16 to 22 feet in length, constructed in accordance with the latest product of the Kahn system. All floors are of steel, tile and concrete construction, the beams supporting the floors being the full width of the building, the loads are taken care of without the use of any intermediate supporting columns. Hy-rib lath is used for the ceiling.

The partitions throughout are of Pyrobar blocks. The exterior facing is red pressed brick on the front and lane elevations, with Dennison tile and plaster for the remaining sides. The main entrance will be treated in marble and tile, and the interior finish throughout will be hardwood trim.



Empress Hotel nearing completion.

The cost complete has been estimated at approximately $105,000. Mr. F. N. Bender prepared the plans and the Trussed Concrete Steel Company of Canada is carrying out the general contract.

A bucket dredge claimed to be the largest in the world was recently launched at Renfrew, Scotland. It is 309 ft. long, 47 ft. wide and 20 1-6 ft. deep. It is to work at the entrance of the Suez canal.

A Reinforced Circular Reservoir

Necessity for a Storage Reservoir - Considerations Determining the Design —Departures from the Plan—Architectural Treatment—Table of Costs

By Alexander Potter, Consulting Engineer, New York City

ONE of the features of the convention of the American Water Works Association held at Minneapolis in June was a paper by Mr. Alexander Potter. The paper gave the description and design of a circular reinforced concrete reservoir, two hundred feet in diameter and twenty-six feet deep, with the side wall wholly above the ground. As the subject is one of exceptional interest we publish the discussion in full.

In the fall of 1910, the writer was retained by the City of Muskogee, Oklahoma, to investigate the existing water and sewerage systems, and to devise methods and means to adapt the existing systems, then overtaxed, to the present and probable future needs of the City.

Upon his recommendation, the people of Muskogee voted a bond issue of $650,000 to carry out the improvements. Of this amount, $325,000 was set aside for improvements to the water system, $300,000 for sewerage improvements, and $35,000 for garbage disposal.

Outline of the Water Works Improvements

Muskogee takes its water supply from the Grand river. The present intake is located in the channel of the river, about 1,800 feet above its confluence with the Arkansas river. Two 16-inch cast-iron pipes, each 2,600 feet long, laid in the bed of the Grand and across the Arkansas river, convey the water to the pumping station. Low-lift pumps raise the water to a three million gallon settling basin. The water is then pumped through a 24-inch main, 20,800 feet long, to the city. A standpipe located in the northern part of the city, equalizes the pressure in the town.

The improvements to the water system designed by the writer consist in the replacing of the two 16-inch suction lines by a 4 ft. 6 in. intake constructed in rock tunnel, with an intake tower at the upper end; the installation of additional high and low-lift pumping units; the construction of a water purification plant, including a six million gallon settling basin, the design and construction of which basin was described in detail by the writer in a paper presented at the Thirty-second Annual Convention of the American Water Works Association at Louisville; the building of the six million gallon reservoir with which this article deals; together with the laying of a 24-inch supply main, 12,600 feet long, connecting the reservoir located on the other side of the city from the pumping station with the existing distribution system.

The Need of a Large Storage Reservoir

The object in constructing the reservoir was two-fold; namely, to increase the pressure throughout the town, and to have at all times a large quantity of water available at a sufficiently high elevation to maintain the pressure in the town at times of heavy draft or in case of a serious breakdown of the pumping station or force line.

The pressure in the central portion of the city ranges from sixty to seventy pounds. At times of heavy draft, this cannot be maintained. A standpipe, 25 feet in diameter and 120 feet high, was erected in 1903 to help maintain the pressure in the city. The effect of the standpipe in this direction, however, is very slight, because of the small quantity of water in the pipe at the height at which it is required.

Conditions Which Influenced Design of Reservoir

A storage and distribution reservoir, to be effective, should always be located as close to the city as possible, otherwise, too great a fluctuation in pressure will exist in the distribution system. A site suitable for a reservoir exists within the city limits. In the northern part, there is a knoll which reaches an elevation of 653 feet above mean sea level. The standpipe was erected on this knoll when the plant was built. In the extreme western end is another knoll, known as Agency Hill, which reaches an elevation of 760 feet, thirteen feet lower than the highest water level in the standpipe. The top of this knoll has a hog-back shape, and averages about 200 feet in width. This is the only hill available for the construction of a distribution reservoir of the size required.

Good water works practice would require a city of

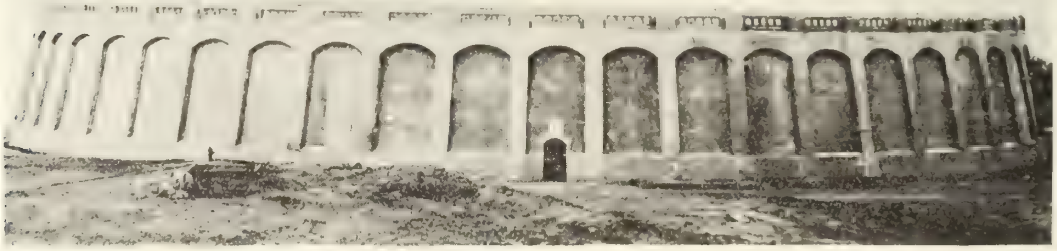


Fig. 1—View of the completed exterior wall.

the size of Muskogee to maintain a fire presure of at least seventy-five pounds. A reservoir with its average water level at the elevation of the surface of the ground on the hill; viz., 760 ft., would give a static pressure of only 69.4 pounds over the central portion of the city. It was decided to adopt some type of construction that would insure a normal water level in the reservoir at least 20 feet above the surface.

The shape of the top of the hill, the size of the reservoir, the necessity of having most of the water stored above the ground—all tend to make the structure one of more than usual interest. The top of the hill consists of three or four feet of clay and scattered boulder, underlaid with layers of clay and shale. Reinforced concrete is practically the only material that could be used to construct a reservoir of the proportion and shape required by the conditions assumed above.

Possible Types of Construction

A circular shape was decided upon. This shape is usually the most economical, but under the existing conditions, unquestionably so.

To obtain the required capacity of 6,000,000 gallons, a circular tank with its diameter limited to 200 feet requires a depth of 26 feet. To construct a circular tank of these dimensions in which the internal pressure is resisted by the tension in the shell, was considered inadvisable; first, because of the high cost of construction, and second, because of the probability of structural defects developing at the junction of the shell and the bottom. Such defects might permanently impair the value of such a structure as a reservoir.

A circular reservoir 200 feet in diameter will, when filled with water, expand 0.96 inches, on the assumption that the steel in the shell is stressed to 12,000 pounds per square inch. This enlarging of the cylindrical shell, as it affects its connection to the bottom of the tank, can be taken care of in one of several ways, all of which are more or less unsatisfactory:

(1) By rigidly connecting the bottom to the side and making the bottom a thin section not more than 6 inches thick and sufficiently reinforced with steel so that it can stretch this amount without producing cracks large enough to allow the water to escape.

(2) By the use of a water-tight expansion joint at the point where the bottom joins the shell.

(3) By preventing the expansion at the bottom of the shell.

The third method calls for heavy, massive construction, is correspondingly costly, and is not successful unless the lower portion of the tank is designed with the greatest of care. When this is done, the economy of this type of construction no longer obtains, as the stress in all circular reinforcement depends on the expansion of the shell, which, if prevented by a rigid connection at the bottom, will reduce the working tension in the circumferential bars directly proportional to the amount by which the expansion of the shell is prevented.

As all of the methods mentioned for overcoming the weakness at the connection of the bottom to the cylindrical shell, are more or less experimental in a large reservoir, the writer was opposed to this type of construction. The amount of circumferential steel reinforcement required in the circular type, also increases with the square of the diameter. Therefore, the economy in the cost of construction found in the smaller tanks, no longer obtains in the larger sizes.

Another type of construction for the side walls of large reinforced concrete tanks is the cantilever section. This type of construction is not, in the writer's opinion, adapted to tanks deeper than 15 feet. In a tank of this type there is always the possibility of hydrostatic pressure developing under the broad base, thereby endangering the stability of the structure.

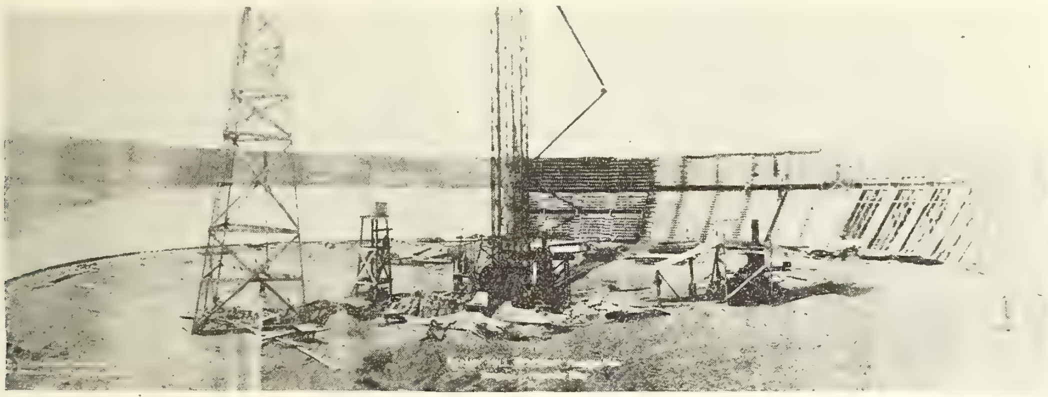


Fig. 2—View of interior wall under construction.

A third method, and one which has been in general use, is that in which the side walls are supported by buttresses or counterforts. This method of supporting the wall sections is a very economic one for tanks of considerable size in which the depth exceeds 8 to 10 feet. A modified type of this construction, in which the deck is inclined and supported by buttresses, is a very economic one for tanks of greater depth and is the one adopted for the Agency hill reservoir described in this paper. The latter type of construction is not adapted to rectangular tanks of considerable depths. In rectangular construction, the corners are very apt to give trouble. Here, the pressures are at right angles to each other, and with the resultant deflections which are appreciable at the top of the tank, also as right angles, it is almost impossible to prevent large cracks from forming at the corners. These cracks are apt to be of such magnitude as to render the structure of little value as a reservoir. This criticism does not hold good when circular or elliptical construction is resorted to. For the above reasons, the type of construction illustrated in Figs. 1 and 2 was adopted.

Description of the Reservoir

The reservoir as built is circular in form, 200 feet in diameter on the inside, and 31 feet deep in the centre. The walls of the tank are supported by fifty buttresses, radially spaced. The deck is carried straight between the buttresses, thus the reservoir is not truly circular but a fifty-sided polygon. For a distance of 10 feet below the water level, the sides are carried down straight; below this point, the sides are inclined at an angle of 45 degrees. The bottom of the reservoir is a segment of a sphere, with a maximum ordinate of 5 feet at the centre.

The shape adopted is one in which practically all of the available water is stored above the surface of the ground. Of the total storage, amounting to 6,000,000 gallons, only 580,000 gallons, or 9.7 per cent. of the total storage, is below the finished grade, and approximately 40 per cent. is stored in the upper 10 feet, thus making it a very effective pressure-equalizing reservoir.

Fig. 3 shows the stresses acting on a portion of the dam subtending an angle of 7 degrees 12 ft. at the centre, all of which is supported by one buttress. In this figure are shown all of the forces acting on the section.

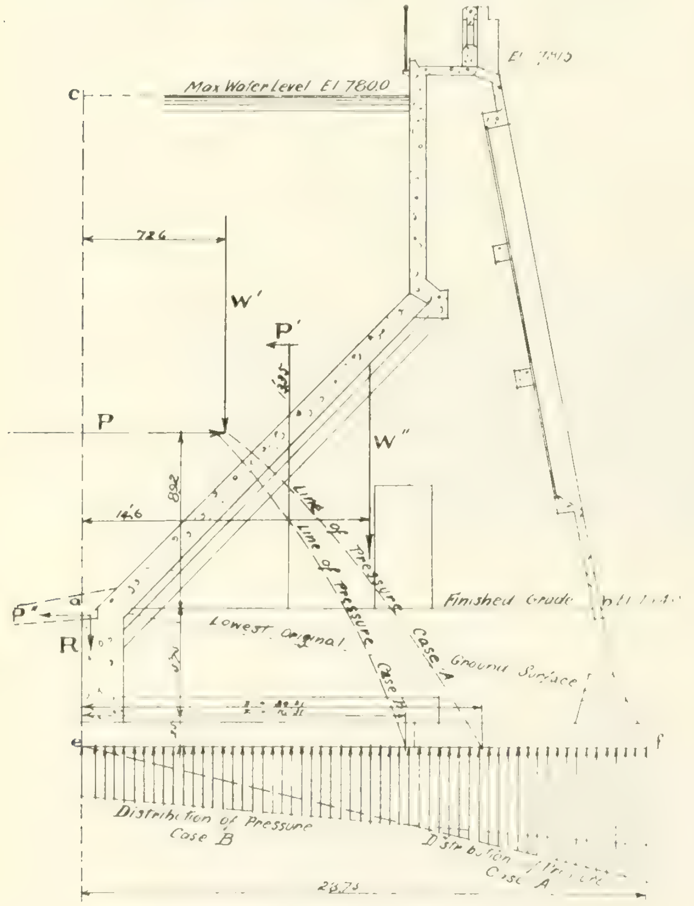


Fig. 3—Stresses on a portion subtending an angle of 7° 12 at the centre.

The horizontal component "P" of the water pressure acts radially outward and amounts to 244,880 lbs. Its line of action is 8.92 feet above the line a-b. The total weight of the water—W′—resting on the inclined deck is 218,560 lbs. with its line of action 7.26 feet to the right of the line a-c. The prismoidal form of the body of water resting on the inclined deck makes the computations, both for the amount of these pressures and their locations, somewhat involved, and for this reason they are not reproduced in this paper.

The weight of the concrete section—W″—based on 145 lbs. per cubic foot of concrete, amounts to 191,000 lbs. Its centre of gravity is 14.6 feet from the line a-c.

As several indeterminate factors enter into the computations necessary to determine the line of pressure in the buttress and the distribution of the foundation pressure over the footing course of each, it was deemed best to compute the limiting values of these pressures under the following assumptions:

Case A—Based on the assumption that each section must stand independent of its neighbor;

Case B—Based on the assumption that the various sections are united into a monolithic structure and that all the forces resulting therefrom are taken into account to the full extent that they may be counted upon to develop in the structure.

Case A—The point where the resultant pierces the base, e-f (Fig 3), under this assumption can be obtained by taking moments about the point "e," as follows:

$$
\begin{aligned}
P\ (= 244{,}880 \times (8.92 + 5.75 + 1.25) &= 3{,}898{,}490 \\
W'\ (= 218{,}560) \times 7.26 &= 1{,}586{,}700 \\
W''\ (= 191{,}000) \times 14.60 &= 2{,}788{,}600 \\
\Sigma M &= 8{,}273{,}790
\end{aligned}
$$

$$
z = \frac{\Sigma M}{W'' + W'} = \frac{8{,}273{,}790}{409{,}560} = 20.21
$$

"z" is the distance from the line e-a to the point where the resultant pressure on the foundation pierces the base.

The total width of the base is 28.75 ft. Therefore, the line of pressure falls 1.13 ft. outside of the middle third, thus making it appear that there will be considerable uplift at the heel of the buttress. This, however, is not the case. The total supporting area amounts to 117.65 sq. ft. Under the assumptions of Case A, the maximum pressure at the toe would amount to 6,727 lbs. per square foot, and the minimum to 29 lbs. per square foot. There is no uplift whatever at the heel. If, instead of a spread footing, a rectangular-shaped footing of the same area were used, the maximum pressure in the footing would be 7,755 lbs. per square foot, and the minimum, a tension of 795 lbs. per square foot.

Case B—The line of pressure determined under Case A will not be the true line of pressure in the complete structure. In the complete structure a number of forces are developed, all of which add to the stability. The effect of these on the stability of the structure will be taken up in detail.

Effect of Bottom Connection

Prior to placing the concrete in the bottom of the reservoir, further study of the problem indicated a probable weakness in the design of allowing the 6 in. bottom slab to span the refilled excavation made necessary in building the cut-off wall between buttresses. The plans of the bottom, therefore, were revised as follows:

To strengthen the structure, the reinforced concrete bottom rests upon and is tied into the face slab by steel reinforcement. The concrete bottom is 6 inches thick and is reinforced with ⅜-in. bars spaced 12-inch centres. Seven feet from the wall, the thickness of the concrete bottom was gradually increased from 6 ins. to a depth of 15 ins. directly over the supporting wall. The reinforcement in the bottom immediately adjacent to the wall consists of ⅜-in. square bars spaced 6 ins. at the perimeter. The bottom is tied into the deck by half-inch bars, 5 feet long, spaced 12-inch centres.

Fig. 4 shows the connection of the bottom to the sides. In this figure are shown all of the forces that act on the section A, viz., the weight of the water resting on the bottom with an intensity of "p" pounds per square foot, the supporting pressure of the foundation increasing from zero at the support to a maximum of "p" pounds per square foot, "x" feet distant from the support; R, the re-action per lineal foot of the supporting wall, and P', the pull per lineal foot exerted by the side walls. This construction would add appreciably to the stability of the buttresses in transferring the line of pressure nearer to the centre of the wall.

In Fig. 4, the distance "x" is limited by the strength of the bottom slab. Assuming a fibre stress of 20,000 pounds per square inch as the limiting stress that can be developed in the steel without permanently impairing the strength of the structure, we obtain a value of 6.28 ft. for x and a value of 3,400 pounds for R. The force T is developed in the ½-in. bars spaced 12-inch centres along the perimeter of the bottom and can reach 5,000 pounds per lineal foot without injury to the structure.

A new city engineer was appointed about this time, who was placed in actual charge of the construction. He was wholly out of sympathy with all the writer's plans.

The need of some additional reinforcement of the bottom at this weak point of connection was apparent when pointed out. As a substitute therefore, all the excavated material disturbed by the construction of the toe of the deck slab was removed and the space filled with plain concrete and the original thickness of the bottom maintained. This not only required more concrete, but it effectually destroyed the function of the drain laid at the foot of the wall to prevent hydrostatic pressure from developing under the structure. The opinion of the writer was not asked upon the wisdom of this change.

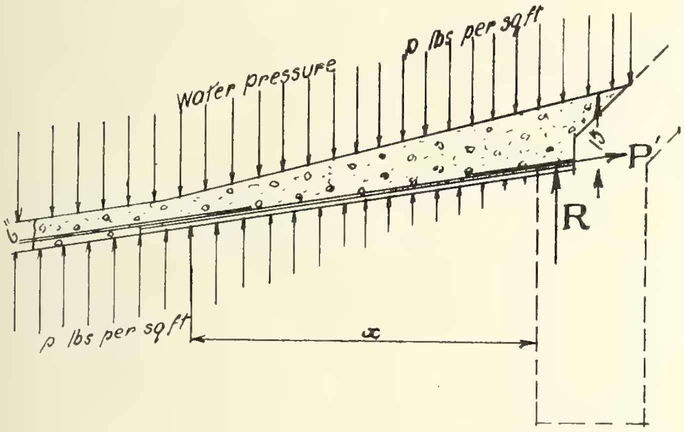


Fig. 4—Showing the connection of the bottom to the sides.

Effect of Continuity of Circumferential Reinforcement on the Stability

The circumferential reinforcement of the structure consists of sixty-five ¾-in. bars, eleven ½-in. bars, and six ⅜-in. bars, giving a total cross-section of 39.97 square inches. All of this reinforcement is lapped sufficiently at all connections so that the steel reinforcement of the shell can be considered to be practically continuous. As the shell expands under the internal pressure, this steel reinforcement is subjected to tension, thereby resisting directly a certain amount of internal pressure. The writer has every reason to believe that the diameter of the tank when filled with water will increase by ½ to 1-inch at the top. This expansion of the tank under pressure produces a stress of from 6,250 to 12,500 pounds per square inch in the circumferential steel reinforcement.

Assuming the average stress in the ring tension due to the circumferential reinforcement to be 6,000 pounds and to increase from 3,000 pounds at the bottom to 9,000 pounds at the top, the total outward pressure per lineal foot of tank thus resisted by the steel, amounts to 2,585 pounds. This is obtained from the formula,

$$T = pr$$

where T = ring tension = 6,000 × 39.97 = 239,820 lbs.
p = total hydrostatic pressure per lin. ft. of perimeter resisted by ring tension.
r = radius of tank, 92.75 ft. measured at the same height as the resultant line of action of the horizontal water pressure.

The height at which the force "p" acts can only be approximately determined. The centre of gravity of the steel reinforcement is 11.5 ft. above the line a-b and with the assumption as to the distribution of the pressure, the line of action of "p" is about 13.35 ft. above the line a-b.

In Fig 3 are shown all of the forces acting on a portion of the dam, supported by one buttress, when this section is considered to form a part of the complete structure. The additional forces acting on the section, due to the rigid connection, are P', R and P''.

P'' represents the radial tension that may be developed by the steel reinforcement connecting the bottom with the inclined deck. The value of P'' may reach 5,000 lbs. per lineal foot, or 52,900 lbs. per buttress, without injury to the structure.

R represents the reaction of the bottom on the supporting wall. This may also attain 3,400 lbs. per lineal foot or 35,900 lbs. per buttress.

The pressure—P'—under the assumptions made, amounts to a maximum of 2,585 lbs. per lineal foot of circumference, or 31,500 lbs. per buttress.

Taking moments about the point "e" of all the forces acting on the section, under Case B we have:—

$$\begin{array}{lrr}
P = 244{,}880 \times 15.92 & +3{,}898{,}490 & \\
W' = 218{,}560 \times 7.26 & +1{,}586{,}700 & \\
W'' = 191{,}000 \times 14.60 & +2{,}788{,}600 & \\
P'' = 52{,}900 \times 7.00 & & -370{,}300 \\
P' = 31{,}600 \times 20.35 & & -643{,}060 \\
\hline
 & +8{,}273{,}790 & -1{,}013{,}360 \\
 & -1{,}013{,}360 & \\
\hline
\end{array}$$

$$\Sigma M' = 7{,}260{,}430 \text{ ft. lbs.}$$

$$\Sigma V' = W' + W'' + R = 445{,}460$$

$$z = \frac{\Sigma M}{\Sigma V} = 16.31$$

Under Case B, the pressure line cuts the base 16.31 feet from the heel, well within the middle third. This gives a foundation pressure ranging from 4,962 to 2,544 pounds per square foot.

The foregoing computations show that the pressure at the toe of the buttress footing may range from 4,962 to 6,727 pounds, and the minimum pressure at the heel from 29 to 2,544 pounds. These pressures are conservative for the character of the foundation upon which the footings are placed.

The buttresses, which are radially spaced, are 15 inches in thickness. At the point where the inclined deck starts, there is considerable tension on the side of the buttress nearest the water. This tension is taken up by three ⅞-inch square bars at a unit stress in the steel of 9,000 lbs. per square inch, making full allowance for the weight of the section; ignoring this, the stress in the steel will be 15,000 lbs. per square inch. Two ⅞-inch square bars are carried up along the face of the incline of the buttress to take care of any possible tensile stresses, especially at the upper end of the incline where these stresses may be considerable.

The face of the buttress upon which the deck rests, is corbelled out to 30 inches. The corbel is reinforced by two ⅝-inch square bars tied together by ⅜ square ties spaced 12 inches centres. These ties serve both the purpose of reinforcing the corbel against cantilever action developed by the deck resting on the outer ends of the corbel and preventing the splitting of the buttresses.

When the structure was about half completed, the writer discovered an error that had crept into the plans which called for ⅜-inch square bars in the spread footings of the buttresses in place of ¾-inch square bars as required by the computations. The footings as constructed, in the opinion of the writer, do not give a sufficient factor of safety in adequately distributing the pressure over the area assumed in the design, and it was therefore deemed highly advisable to reinforce the spread footings.

This method required the cutting out of each buttress already constructed, a section, marked A-B-C in this plate, and placing upon the footing a reinforced concrete beam 3 feet wide on the base and about 27 inches deep under the buttress and 12 inches deep at its outer end. This beam was to be reinforced with six ¾-inch square bars.

To obtain a good bond between the old buttress and the new work, it was proposed to maintain a head on the semi-liquid concrete so as to force it into the buttress and to maintain this head until the new concrete had obtained its final set.

It is to be regretted that the city officials failed to appreciate the importance of strengthening of footings, which could have been done at a nominal cost and would not have added more than one per cent. to the total cost of the structure. In thus refusing to comply with the plans, they have assumed all responsibility for the structure. The structure is strong enough as built to withstand all the pressures that may come upon it, but there is always a possibility that one of the buttresses may settle sufficiently to impair the usefulness of the structure as a reservoir. The cost of repairing this defect may exceed many times the cost of reinforcing the footings in accordance with plans. Had the suggestion been carried out, it would have effectively reinforced the spread footing so as to enable it to properly distribute the pressure over the foundation.

Construction of Deck

The deck, with the exception of the top, is not tied into the face of the buttress by steel reinforcement. The vertical portion of the deck is 10 inches thick. The thickness of the inclined portion varies from 12 inches at the top to 15 inches at the bottom. The steel reinforcement is stressed to an average of 5,200 pounds per square inch in the vertical portion of the deck, and to 10,000 pounds in the lower or inclined portion. The deck of the reservoir is constructed as a monolith; no expansion joints are used. This type of construction throws additional tension upon slab reinforcement, especially in its upper portion. Provision has been made, in the design, for this additional stress by using a somewhat lower working tension in the slab reinforcement than is otherwise necessary. A widening of the diameter of the tank at the top, of as much as an inch, will increase the stress in the circumferential reinforcement to 17,200 lbs. per square inch.

Attention is called to the connection of the inclined to the straight portion of the deck. This joint, which is naturally a weak one, has also been made a construction joint. It has been strengthened by a 12 x 16-inch concrete beam reinforced with four ¾-inch square bars.

Hydrostatic Uplift

In this article, no mention whatever has thus far been made of the possibility of hydrostatic pressure developing either under the concrete bottom or against the curtain wall, and thereby affecting the stability of the structure. This is guarded against by under-draining the spherical bottom with four and six-inch tile drains. Five 4-inch lines of drains are laid radially and drain to a sump at the centre of the reservoir. From this point a 6-inch drain is carried radially outward to a free outlet on the hillside. A circular line of 4-inch tile drain is laid entirely around the outer edge of the spherical bottom just above the footing of the 24-inch circular cut-off wall.

With these provisions, it is almost impossible to conceive of hydrostatic pressure developing to an extent to make it necessary to take it into consideration in the stress analyses. Under the worst possible conditions, with all the underdrains clogged, the hydrostatic uplift is limited to the bottom of the reservoir and the footing of the 24-inch wall, and even then the effect of it on the stability of the structure is negligible.

Architectural Treatment

At the writer's recommendation, the city bought the property immediately adjacent to the reservoir to convert it into a park. To improve the appearance of the structure, the buttresses are widened out to three feet at the back, and between them a concrete curtain wall, four inches thick, is carried up for a distance of four feet above the finished grade. Between the tops of the buttresses, concrete arches are sprung. Each arch has a rise of three feet and a clear span of three feet less than the distance between the buttresses. The recess thus formed is filled at a depth of 12 inches with a thin curtain wall of stucco placed on hy-rib. At intervals of 5 ft. 7 ins., the hy-rib is supported by reinforced concrete beams. A concrete walk, 2 ft. 8 in. wide, extends entirely around the reservoir. On the outside of the walk, a concrete railing in conformity with the architectural treatment of the reservoir is built. The false construction just described gives the reservoir a pleasing appearance of massiveness. A driveway, 33 ft. 6 in. over all, extends entirely around the reservoir.

Piping and Drains

The water enters the reservoir through a 24-inch line. The outlet is located at the centre of the reservoir and is of the same size. Circulation is maintained by two check valves, one in the inlet and the other in the outlet, so arranged that the direction of the flow in these pipes cannot be reversed.

The overflow is located 18 inches below the top of the tank. The overflow pipe is 10 inches in diameter. A 10-inch cast iron pipe with its inlet in the lowest part of the spherical bottom and its outlet on the hillside, drains the reservoir.

Monolithic Construction

Some question may be raised as to the economy of constructing a reservoir of the size described without expansion joints. The principal advantage that can be gained by monolithic construction is a general increase in strength. In a large structure, this increase in strength is by no means as great as a casual inspection leads one to believe. It is obtained only at a sacrifice. The stresses in the deck, when built continuous, are no longer static determinate quantities, and their amounts cannot be determined with any degree of accuracy. The stresses developed in the deck acting as a beam are also increased a more or less indeterminate amount by the expansion of the shell under pressure. For these reasons, comparatively low unit stresses must be used in designing the deck. The gain in strength due to continuity of deck construction, practically decreases as the square of the diameter in a structure of the type described. The increase in strength due to continuity of deck construction in large tanks is therefore very small.

Water-tightness of the Structure

Under ordinary conditions, the writer is opposed to the use of water-proofing ingredients or water-proofing applications, as both add considerably to the cost of concrete work. It is far better to put the value of the water-proofing materials into the concrete work itself by adding more cement. In general, the use of water-proofing ingredients or application tends to poor construction work, the contractor counting upon the water-proofing to materially help out careless construction.

The only water-proofing called for in the specifications under which the reservoir was constructed, was two coats of neat cement wash to be applied with a whitewash brush on the inside of the basin. The second coat must be applied before the first one has had time to get very hard.

Before the final acceptance of the work, the contractor was called upon to render the structure water-tight if leakage develops in the basin in excess of five gallons per minute. The reservoir has been filled for a number of months to within ten feet of the top, and the leakage, as measured at the outlet of the underdrains, at no time has exceeded half a gallon per minute. No leakage whatever is visible on the outside of the shell.

Horizontal construction joints are used freely. The unfinished surface of these was always left in as rough a condition as possible, but was never roughened up after the concrete had partially set. The writer's experience is that this roughening often loosens the stones in the partially set concrete, but not sufficiently so that the loose stones can be removed by brushes, a condition which is apt to impair the water-tightness of the structure.

To start a day's work, the old concrete surface was thoroughly cleaned with wire brushes and water, and a semi-liquid mortar mixed in the same proportions as the mortar in the concrete was poured over the old work to a depth of half an inch. This method has given good, water-tight horizontal construction joints.

Vertical construction joints were permitted only over the buttresses as such joints are very difficult to make water-tight.

Cost of the Structure

The following is an approximate estimate of the materials required for the structure, together with the contract unit prices:—

7,271	cu. yds. excavation, including grading,	at	$ 0.55	$ 3,999.05
100	cu. yds. rock excavation	at	1.70	1,700.00
965	cu. yds. 1:2:4 concrete masonry	at	9.00	8,685.00
1,739	cu. yds. 1:3:6 concrete masonry	at	7.00	12,173.00
3,400	bbls. cement	at	1.50	5,100.00
189,900	lbs. steel reinforcement	at	0.0425	8,070.75
650	lin. ft. parapet wall	at	1.40	910.00
196	lin. ft. 24-in. cast iron pipe	at	5.40	1,058.40
215	lin. ft. 10-in. cast iron pipe	at	2.00	430.00
110	lin. ft. 3-in. cast iron pipe drain ...	at	0.50	55.00
12,300	lbs. cast iron specials	at	0.05	615.00
2—24-in.	check valves	at	200.00	400.00
1—24-in.	gate valve	at	240.00	240.00
1—10-in.	gate valve	at	25.00	25.00
880	lin. ft. 4-in. tile drain	at	0.12	105.00
160	lin. ft. 6-in. tile drain	at	0.20	32.00
90	lin. ft. 12-in. vitrified pipe	at	0.70	63.00
1	strainer 24-in. outlet pipe	at	7.50	7.50
630	lin. ft. 1-in. pipe railing	at	0.40	252.00
500	lbs. wrought iron	at	0.05	25.00
20,300	sq. ft. of stucco on hy-rib	at	0.15	3,045.00
	Total contract price			$46,991.30

The reservoir was built on the summit of a hill about a mile from the nearest railroad station. All water used for concreting had to be carted up the hill, a distance of about a mile.

The final estimate exceeded the bid price by a very small percentage. The contractor's profit on the work approximated twenty per cent., indicating a reasonably economic reservoir, yet one which presents a very attractive appearance.

The opening of the first section of the percolating filters for the biological treatment of the sewage effluent at Dalmarnock Sewage Works, Glasgow, took place on June 23rd. The necessity for submitting the Dalmarnock chemically precipitated effluent to further treatment has long been recognized by the Corporation, and it was decided to construct filters 1.28 acres in extent on the west side of Swanston street. It is expected that the new filter will be able to treat 4,000,000 gallons of precipitated effluent per twenty-four hours, and when the full installation is completed the filters will be capable of dealing with 24,000,000 gallons per twenty-four hours.

Steel king-post trusses were employed in a large reinforced-concrete hotel of mushroom flatslab construction in Sioux Falls, S.D., to support one of the walls of a light area extending 90 ft. into the building. One wall of this area is supported on the regular line of columns, while the other is placed in the centre of the panel, and to support it from the second storey up steel king-post trusses were placed in the second storey and were supported on the concrete columns of the first storey. The span of these trusses is 24 ft., and they carry a four-storey wall. Each of the five trusses supports a concrete column, which in turn carries the lineal beams and the brick wall. Where exposed these trusses are covered with concrete in order to protect them, as far as possible, from injury in case a fire should start in the hotel.

The extent to which cement tiles are appreciated in Germany is indicated by the fact that the production has now reached the large total of 200,000,000 tiles yearly. The machines generally employed involve two separate operations—the mixing of the mortar and the pressing of the tile. An improved type of tile machine has recently been devised wherein the measuring, mixing, and colouring of the materials and the work of moulding are performed by the aid of two men. The machine is said to be capable of turning out 6,000 tiles, 9 in. by 12 in., in a day of ten hours at a cost of about 36s per thousand.

Canada's Half-Yearly Building Returns

THE building operations throughout the Dominion for the first six months of the year 1913 show, when compared with the same period of 1912, a slight decline. The total of the permits issued in the thirty-two cities tabulated below amounts to $79,787,919 for the first six months of the present year. The total for the same period of last year was $87,353,151, indicating the very slight decline of eight per cent. However, it must be remembered that the year 1912 was an extraordinary year. When the totals for the first half of 1913 are considered apart from any comparison they show a building expansion that would be highly gratifying under ordinary circumstances but our proneness to make comparisons gives rise to a feeling of disappointment because we have not surpassed last year when as a matter of fact the showing has been very creditable indeed.

Out of thirty-two cities reported twenty show a substantial increase, while the remainder show a decrease when compared with 1912. In the amount of permits issued Toronto still leads, with an increase of four per cent. The increase for the first five months of the year was considerable but June showed a decline of over a million dollars. Montreal is second in the value of the permits issued and shows an increase of twenty-three per cent. The highest percentage of increase falls to London and Port Arthur, both rejoicing in a growth of about one hundred and ten per cent. over last year. The increased percentage represents in London about one-half million dollars and in Port Arthur about three-quarters of a million.

The decline, of course, is due to the money stringency, and it is hoped that the spring will see a marked recovery in tone and confidence.

Reports

Fort William reports an increase for the six months. During June 58 permits for houses were issued at an estimated cost of $431,735.

Vancouver—While this city shows a decrease, permits were issued in June for 131 houses, 6 apartment houses, 18 factories and 13 offices and stores. One thousand one hundred and ninety-seven permits were issued for the six months.

Victoria—From the British Columbia capital, Mr. Northcott, Building Inspector, reports a large decrease compared with 1912 but an increase of nearly one hundred per cent. over 1911.

Moose Jaw—The building permits here fell by twenty-four per cent. But the next six months promise to be very active. A terminal elevator, school, and building blocks are in sight for July, totalling nearly two millions.

City	June 1913	June 1912	First 6 mos. 1913	First 6 mos. 1912	Increase per cent for 6 months
Toronto	$2,036,928	$3,292,766	$13,734,410	$13,195,271	4
Montreal	2,278,424	1,718,505	9,942,285	8,065,993	23
Winnipeg	1,843,350	3,210,370	9,531,400	11,487,150	17*
Vancouver	908,881	1,219,780	7,118,253	8,132,720	12*
Edmonton	1,428,615	2,567,235	6,345,490	7,538,862	18*
Calgary	1,498,620	2,210,000	4,483,620	8,540,670	48*
Hamilton	550,000	670,600	3,391,450	3,145,600	8
Victoria	365,985	617,860	2,757,765	4,647,600	41*
Regina	810,995	1,048,830	2,726,130	2,549,770	7
Ottawa	578,650	417,750	2,646,505	2,120,000	25
Fort William	431,735	232,070	2,636,835	1,743,425	51
Saskatoon	249,310	1,601,000	1,859,395	4,634,000	59
Moose Jaw	551,610	531,555	1,667,895	2,194,525	24*
Medicine Hat	248,515	212,445	1,366,680	1,000,617	36
Maisonneuve	241,750	243,200	1,153,123	1,572,428	26*
London	155,653	140,558	1,063,867	509,598	109
Port Arthur	511,895	174,884	1,475,805	702,474	110
Prince Albert	304,600	278,900	1,055,690	1,008,300	4
North Battleford	352,600	335,285	736,095	565,190	30
New Westminster	139,875	96,850	719,135	785,578	8*
Windsor	183,125	114,125	513,790	433,330	18
Berlin	42,675	85,925	419,229	340,058	23
Lethbridge	24,112	103,503	402,555	719,345	44*
Kingston	49,960	75,335	354,295	224,059	58
Brandon	182,769	154,850	350,919	354,850	1*
Peterborough	94,806	67,095	305,165	187,858	62
Galt	31,810	28,080	256,737	209,032	23
Welland	34,976	19,313	229,186	124,186	85
St. Catharines	55,720	128,950	236,780	338,640	30*
Nanaimo	11,000	36,853	160,965	125,292	28
St. Thomas	22,100	5,280	74,570	40,645	83
Chatham	10,300	19,090	71,900	116,085	38*
	$16,231,344	$21,658,842	$79,787,919	$87,353,151	

A falling off of about 8 per cent

*Decrease

Medicine Hat has approved of by-laws providing for very extensive civic expansion in roads, sewerage system, etc.

Galt shows the very creditable increase of twenty-two per cent., but finds building operations delayed by a lack of brick.

Nanaimo has recently been connected with the mainland by means of a telephone cable. This will doubtless facilitate business. Although handicapped by a miners' strike there has been an increase of twenty-nine per cent.

Winnipeg, although showing a slight falling off from last year, has issued nine and one-half million dollars worth of permits. A very satisfactory year surely.

Saskatoon—Mr. Vernon Knowles, while reporting a considerable falling off in the value of the building permits, is at the same time able to report a very substantial amount of building under way. There is no tone of uncertainty in the report. The Dominion Government is about to let the contract for a two million dollar interior storage elevator. Contracts for a Presbyterian College, a separate school and a large city hospital have been awarded. Residential building has increased. The falling off has occurred in the large structures owing to the difficulty of securing loans.

New Grand Trunk Pacific Hotel

Following out their policy of constructing a chain of hotels, the Grand Trunk Pacific Railway Company have commenced the erection of the Hotel Qu'Appelle at Regina, the capital of Saskatchewan. In some respects the site is similar to that of the Chateau Laurier, Ottawa, on Major Hill Park, immediately opposite the Central Union Station, and but a short distance from the Dominion Houses of Parliament. In Regina, the site selected is Wascana Park, at the corner of Sixteenth avenue and Albert street, two sides facing these thoroughfares and the other elevations overlooking the park and commanding a view of the Provincial Parliament Buildings. The architects, Messrs. Ross & Macdonald, Montreal and Winnipeg, have arranged with the owners to set the building back from the street line sufficiently to give it a setting and relationship to the surrounding landscape that takes advantage of the admirable situation to the fullest extent. Architecturally, like the other three G. T. P. hotels, it is of the Chateau type and promises to be equal to, and may even excel in design and detail, also in arrangement and equipment and structures completed and now under construction.

Immediately opposite the hotel, the new station will be erected, providing for tourists and travellers, as guests, convenient and immediate communication with the hotel. The station building will also include the power house, from which light, heat and power service will be transmitted to the hotel through a service tunnel under the streets.

The main entrance will be placed in the centre of the Albert street elevation. A few steps lead from the entrance to the concourse or rotunda, and immediately opposite this entrance, commanding also the ladies' entrance, the elevator, stair, palm room and dining room approaches, has been placed the office. Adjoining the rotunda the telephone and telegraph booths and the news and cigar stands will be situated. The palm room and main dining room overlook the park, and doors from the palm room open on to a terrace, from which steps lead down to the park.

The main dining room, palm room and rotunda extend through the height of two storeys, the main floor and the mezzanine. The mezzanine provides a musicians' gallery for the dining room, a gallery overlooking the rotunda and a spectators' view of the dining room. It also provides a private dining room, a small banquet room and manager's office, providing the facilities for private entertainment and gives the manager's office a key position in the administration of the building. Immediately upon entering and before ascending the few steps to the main floor, approach may be made to the grill room and bar by stairs leading left and right from this entrance landing. Above the main floor and the mezzanine, there will be seven floors for guests' bedrooms. All rooms facing Wascana Park and the streets, will have outside private bathrooms, all rooms to the main court will have running water, and on every floor will be provided ample toilet room accommodation.

Hotel Qu'Appelle, Regina.

There will be a total of two hundred and twenty-four bedrooms, almost all of which can be used as double rooms on account of their large dimensions. The grill room, bar, barber shop, general toilet, main service and kitchen are in the basement, and the laundry, stores, locker-rooms, elevator machinery and refrigerator equipment in the sub-basement.

In construction the exterior will be of a selected grey brick with stone dressings and finish; the interior will be of steel frame and re-inforced concrete. The typical floors of guests' rooms will be finished with hardwood doors and enamelled white trim.

The man who spends all his time looking after the little leaks of his business will have no time to spend in watching the big leaks. Make it somebody else's business to watch for the minor losses.

Corrosion of Lead in Various Mediums*

Nature of Corrosive Action—Imbedded in Concrete—Buried in Soil — Immersed in Water — Effects of Electrolysis

By Richard H. Gaines, Chemist Board of Water Supply, New York.

THE problem to determine what particular metal or combination of metals is best suited for a given purpose in engineering construction is sometimes one of great difficulty. A mistake in judgment may be at the expense of economy or durability or may even lead to a disaster. The decision of the engineer, to be correct, must be based on a thorough knowledge of the physical properties of the metals under consideration, and this is generally gained by experience.

In many constructions the choice of some of the materials is determined more by their durability under conditions of working than by their strength or other properties, a more expensive and weaker material being often chosen in preference to a cheaper and stronger one on account of superior resistance to corrosion. Examples of this are afforded by the frequent use of special bronzes in places where, except for their durability, the stronger and cheaper iron and steel would be preferable.

Incidental to a recent study to aid in determining whether it would be safe to substitute lead-lined steel pipe for bronze pipe where a material of great durability was required in portions of a water conduit some experiments were made and facts were collected from the experience of others bearing on the corrosion of lead. From the data obtained it was concluded that for the particular purpose in view the relative merits of bronze pipe and lead-lined steel pipe would hardly admit of comparison. Under whatever conditions lead withstands the action of water or acids, the bronzes are similarly unaffected, while under other conditions of service in which the bronzes are practically untouched by corrosive action lead would be destroyed. Lead-lined steel pipes no doubt have their uses in the chemical manufacturers, and may also find extensive application for the conveyance of hard waters, or acid waters of a certain character in mines, but they cannot be recommended for use in connection with city water supplies. Owing to its peculiar physical and chemical properties, lead affords a doubtful protection to iron or steel conduits from corrosion, and under some conditions might prove an absolute disadvantage, if not an actual menace, to the life of the pipe.

The Action of Alkalies

A peculiarity of lead is that it may be corroded either by alkalies or acids. Thus, lime mortar, lime putty and lime water will attack lead; if the mortar is very alkaline, the effect will be greater. Proof of this was established by experiment as well as from observation of lead service pipes in wet concrete.

The following experiment was made to test the effect of an alkaline seepage water on lead: A weighed sample of lead was immersed for a period of eight days in seepage water that leaked through the concrete walls of a tunnel. The sample was taken out daily, washed, dried and weighed, and the loss in weight noted. At the end of the test period it was found that progressive corrosive action had taken place, amounting to 0.132 per cent. in eight days, or at the rate of about 6 per cent. a year.

Several examples of corrosion of lead service pipes in wet concrete were observed, one of which will suffice to be mentioned here. In a bathing establishment in Brooklyn two lead pipes passed up through a concrete floor—one of the pipes was for hot water and the other for cold water. Owing to the free use of water on the floor the concrete was wet much of the time. Here the lead pipe for the conveyance of hot water was nearly destroyed by corrosion in five years, while the cold-water pipe was also deeply corroded. No evidence was found of leaking electric currents in the building to aggravate this action.

Corrosion in Concrete

A series of experiments was made to determine what loss lead suffers from corrosion as compared with steel and some other metals when embedded alone or in contact in very damp concrete.

Specimens of the following metals were weighed and embedded singly and in contact in damp concrete and allowed to remain therein for two months. At the end of the test period the concrete blocks were broken up and the metals taken out, carefully cleaned, dried and reweighed, the loss in weight representing the amount of corrosive action in each specimen.

Single Specimens

Metal:	Grams Wt., Jan. 2, 1912	Wt., Mar. 4, 1912	Grams Loss 2 mo.	Loss Grams sq. ft.
Manganese bronze	73.6655	73.6475	.0180	.32
Steel	39.1556	39.1481	.0075	.135
Lead	92.3806	91.7146	.6660	11.99
Copper	73.7630	73.7272	.0358	.64
Monel metal	62.9667	62.9646	.0021	.04
Metals in contact:				
Steel	37.0380	37.0270	.0110	.20
Manganese bronze	70.6864	70.6700	.0164	.30
Steel	37.1746	38.1700	.0046	.08
Lead	90.0399	89.5408	.4991	9.08
Steel	38.8055	38.8031	.0014	.03
Copper	70.1913	70.1348	.0565	1.04
Steel	38.6396	38.6271	.0125	.23
Monel metal	60.1092	60.1074	.0018	.03
Steel	34.5625	34.4626	.0999	2.48
Lead	83.8596	83.5163	.3433	6.77
Copper	68.9752	68.9626	.0126	.31
Steel	34.8702	34.8026	.0676	1.68
Fiber	....	....	....	....
Copper	64.1247	64.1122	.0125	.31

The resulting losses show but slight differences when in contact and alone, and therefore give no evidence of electrolytic action when the metals are coupled in concrete. With the exception of the lead, the corrosion loss of all the metals was small, that of the monel metal almost nil.

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* Engineering Record.

The action of the lead confirms results obtained from actual experience and shows that this metal may suffer very appreciably in an alkaline as well as acid medium. The corrosive action in this case was observed to be solvent in character, no protective coating being formed to hinder further change.

Sir William Crooks once said that lead was the first cousin of thallium, which Lothar Meyer called the ornithorhyncus of the metals. This strange Jurassic animal possessed the body of mammal and the beak of a bird. Whether such a doubtful order of relationship in the family of elements is true or not, it is a fact that the chemical properties of lead are very peculiar, and they present some remarkable contrasts. While lead resists the action of sulphuric and hydrochloric acids in a far higher degree than iron, zinc or tin, it is readily attacked by weak organic acids and is slowly dissolved even by pure water containing air.

With respect to corrosion the behavior of lead is decidedly inconsistent. Notwithstanding that lead is very slightly acted on by some of the strong mineral acids in the cold, it is soon extensively corroded when exposed to the action of moist air in the presence of carbonic acid and eventually becomes converted into a mass of white lead. Since carbonic acid is produced abundantly in the decay of animal and vegetable matter, metallic lead is much affected when kept in contact with such substances in the presence of air, the oxygen of which unites with lead to form an oxide which then combines with carbonic acid. The oldest process for the manufacture of white lead depends upon the corrosion of the lead by contact with decaying organic matter in this manner. Bloxam, in his work "Metals and Their Properties," makes this statement: "In breach-loading cartridges where grease is employed as a lubricator the bullets have sometimes become partly converted into white lead and thus increased so much in bulk as to burst open the copper case of the cartridge and render it useless."

The Corrosion of Lead in the Soil

The impression prevails among many engineers that in the absence of stray currents the corrosion of lead in the soil is neglible. This is not always true. The facts are that while in some soils lead is very slowly affected by corrosion, in others an active chemical change or deterioration of one kind or another takes place. For example, "the lead of old coffins is sometimes found to have become almost entirely converted into an earthy looking mass of basic carbonate of lead." (Bloxam, "Properties of Metals").

The Russian engineer A. N. Schensnovitsch, of Odessa, recently sent by his government to New York to examine our pier and dock system, told the writer of an interesting case with which he was familiar of the destruction of lead water pipes by corrosion that occurred in St. Petersburg during the '70s, before the days of industrial electricity or other conditions that could give rise to electrolysis. According to this engineer, in 1860-61, or thereabouts, a quarter of the City of St. Petersburg was served with water by a system of lead mains. In from ten to fifteen years these pipes had become so pitted by corrosion as to necessitate extensive changes. The cause of the trouble was attributed at the time to some local peculiarity of the soil, the exact nature of which was never ascertained. Mr. Schensnovitsch stated that the whole system was subsequently replaced by cast-iron pipes, which had proved durable and satisfactory. The superintendent of the waterworks of a suburban town in the vicinity of New York City told the writer that several years ago he had occasion to renew a number of lead service pipes on account of deterioration from corrosion. As he expressed it, "The pipes were pretty well used up, presenting the appearance of just having passed through a severe attack of smallpox. The lead, moreover, had the appearance of having lost all its vitality. There was no indication of electrolysis playing any part here."

In several cases reported by recent engineering periodicals accounts are given of the lead pipe in the earth "losing its vitality, becoming brittle and porous, rendering renewal necessary after a comparatively short period of service, or the substitution of some other kind of pipe." Cases are also reported where it was deemed necessary to lay the lead pipe in wooden troughs, to surround it with pitch, or to otherwise protect it from the corrosive influence of the soil.

The Corrosion of Lead in Water

So far as ordinary atmospheric corrosion is concerned, lead is one of the most durable of the common metals, undergoing no change in dry air or in water perfectly free from air. It is, moreover, only slightly affected by hard waters or dilute solutions of either hydrochloric or sulphuric acids. The latter acids quickly form coatings on the surface of the metal, which protect it from further action. Lead, however, is readily dissolved by water high in nitrates and by dilute nitric acid. It is also more or less rapidly corroded by weak organic acids in contact with moist air. Certain waters which actively corrode lead are those with a slightly acid reaction from peaty swamps. There are certain microbes associated with peat which are acid producing, and which impart acidity to waters which have been in contact with peat.

Soft waters are particularly unsuited for conveyance in lead pipes, and in such waters containing nitrates derived from decaying vegetation the amount of lead dissolved is large. Every plumber knows that pure soft water will attack, and sometimes destroy, lead pipes. For this reason it has often been found necessary to line lead pipes with tin.

When lead pipes are acted on by water the corrosion is more or less irregular, some portions being hardly attacked, while in other parts holes may be eaten through. This does not seem to be due to any irregularity in the metal but merely to accidental circumstances. One authority quotes various experiments to show that lead water pipes should be kept full of water all the time to prevent deterioration.

The corrosion of lead by pure aerated water takes place as follows:

Lead (Pb) + Dissolved Oxygen (O) = Lead Oxide (PbO)

PbO + Water (H_2O) = Lead Hydroxide (PbO_2H_2)

If exposed to the action of clean, soft water containing the normal quantity of dissolved oxygen, the lead is oxidized to hydroxide, which dissolves. After a time this is converted, by the action of the atmospheric carbon dioxide, in the basic carbonate of lead, $2PbCo_3$ and $Pb(HO)_2$. Lead hydroxide is then again formed, and thus the corrosive action may be continued.

Potable waters always contain a certain amount of salts in solution, and the corrosive action depends to some extent upon the nature and quantity of the salts present. The waters which act least on lead are those containing carbonate of lime, phosphate of lime, and, in a less degree, sulphate of lime. The waters which are most liable to act upon lead are those obtained from upland gathering grounds, waters which are soft and usually of remarkable purity When highly oxygenated the latter form no protective coating against solvent action. On account of the quantity that may be thus dissolved lead has always been considered a more or less dangerous metal in connection with water supply for drinking purposes. Acting as a cumulative poison, its salts produce serious results if taken into the system, even in very minute quantities, for any length of time. Although indirectly related to the subject of corrosion, the experience of certain of the towns of Lancashire and Yorkshire in England should never be forgotten where the use of lead water pipes is under consideration. In these towns lead poisoning was prevalent for a considerable period, doing immense damage to the health of the inhabitants before its real nature was recognized and its cause discovered. Incidentally, it may be said that the compounds of lead are poisonous practically in proportion to their solubility. Thus the metal itself and its sulphide being incapable of absorption as such into the system are practically innocuous, while the soluble salts—nitrate, chloride and acetate—are active irritant poisons. The oxide, sulphate and carbonate are much less active, but continued exposure to lead fumes or to any atmosphere in which these substances are present in the form of dust brings on first "lead colic" and later, if exposure to the dust or fume is continued, a more chronic form of poisoning called "lead palsy," accompanied by great emaciation.

The Corrosion of Lead by Electrolysis

Instances are commonly reported of the electrolysis of lead pipes. In some of these cases, such as have occurred at St. Paul, Omaha and Paterson, N.J., all the phenomena of electrolysis were no doubt present. In others damage from stray currents has by no means been proved, while the observed phenomena rather suggest ordinary chemical corrosion. In several cases of lead-pipe deterioration, called electrolysis, it was found that molecular changes of another character had taken place in the metal, similar to what Milton and Larke (Proc. Inst. C. E.) described as decay.

The electrolysis of either lead or lead-lined steel pipe, however, is a very real trouble, and the interest attaching to it here is the ease with which it may occur and the rapidity with which serious damage may be done. A few years ago the Westinghouse Electric Company showed by experiments at Pittsburgh how readily buried lead pipe could be corroded by electrolysis. This company also made a series of tests in different soils to compare the corrosive action of stray currents an embedded lead and steel pipes. It was demonstrated that in some soils lead pipe was even more rapidly destroyed by electrolysis than steel. This accords with actual experience reported from several cities. At St. Paul, where considerable damage to lead water pipe occurred, presumably from electrolysis due to escaping current from electric railway lines, cast-iron pipe in the path of the same currents is said to have been little affected by corrosion. In New York City an engineer connected with the water department told the writer that in the few instances in which there had been any trouble from electrolysis of water pipe in Manhattan, "the lead joints were the first to go."

Improvement in Garbage Incinerators

By John Hammersley-Heenan

The amount of garbage or refuse that has to be disposed of daily in a city averages from about three-quarters to one ton per thousand of population, so that in a city of five hundred thousand people there will be nearly 500 tons to collect and dispose of every day.

In the early life of a town it is usual to collect and dump the refuse upon some waste ground at a convenient point in or near the town; but as the population increases, and the town spreads, it becomes more and more difficult to find available space for this purpose, and ultimately the city authorities are forced to turn their attention to other methods of refuse disposal.

The Garbage Incinerator—or Refuse Destructor, as it is more commonly called in England—has come very much into favor during the last ten years or so. In plants of this description the ashbin and other waste materials of a city are burned at a high temperature, the heat from the combustion being utilised to generate steam. The burning of refuse is not new; in fact it may be said to be very old, for it has been the practice of natives living in some hot climates to dispose of their refuse in this way for many centuries. Even with us the practice is by no means new, and if records could be traced it would be found to have existed for some hundreds of years. It was however not before the middle of the 18th century that the matter was seriously take up on a large scale, and a number of crude furnaces constructed in London.

These furnaces were improved upon from time to time, but it was not until about twenty-five years ago that certain engineers realised the possibility of utilising the heat generated. Setting to work, they designed new plants, the forerunners of those in operation today.

First Destructors Designed

It would be impossible to describe many of the earlier designs in an article of this kind without making it tedious. Let it suffice therefore just to mention a few of the most important and give a short description of one of the best known modern incinerators.

One of the first plants of any importance was that built by Messrs. Manlove & Alliott from the designs of Mr. Fryer in about the year 1876. The arrangement of this furnace is shown in Fig. 1. At the back of each cell there are two openings. Through the one the refuse is fed into the cell, and from the other the gases of combustion are carried off. These openings are clearly explained in Fig. 1, the right-hand half illustrating the charging inlet, and the left-hand half the discharge outlet through which the gases pass from the furnace to the large central flue or combustion chamber, and thence to the chimney stack. A number of these plants were built in England and some of them are still in use; but the type is rapidly disappearing.

About ten years after the first "Fryer" furnace was built, a new design appeared upon the market known as the "Beehive." It had several new features, but did not come up to the expectations of its designers. Mr. Young, of Glasgow, designed a furnace about this time, which was interesting inasmuch as he closed up his ashpit and used a fan. Following these was that of Mr. Horsfall (Fig. 2). The air supply in this furnace was forced by means of a steam jet. A year later the "Warner's Perfectus" appeared. It gave good results, and was a decided advance in design. During the year following a great many improvements were made and a number of new destructors appeared upon the market, notably those of Messrs. Bulnois & Brodie (Fig. 3) and Messrs. Beadman & Deas (Fig. 4).

Messrs. Meldrum Bros. and Messrs. Heenan & Froude were the next to appear upon the market with furnaces very similar in design. The principal feature in these designs was the adoption of what is known as the continuous grate and it was this principle combined with the other improvements made that has enabled these plants to become the efficient machines they are. As many of these plants are being installed all over the world, a short description of them should be of interest.

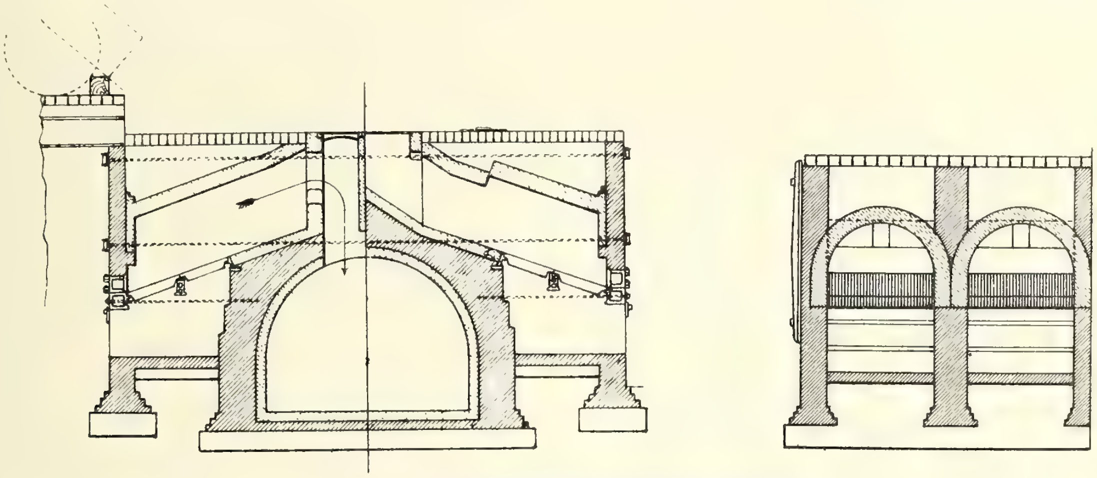

Fig. 1.—One of the first incinerators designed.

Large stations consist of a number of units all under the same roof, and connected to a common chimney, each unit consisting of a continuous grate, combustion chamber, boiler, air-heater, and fan.

The refuse is burned upon the continuous grates, hot air being forced through it from the ashpit. The gases of combustion pass off to the combustion chamber, where the combustion is further advanced. This chamber also acts as a trap for much of the dust carried over from the grates. The gases then pass through the boiler giving up most of their heat to the water, but as they leave the boiler still retaining a fair amount of heat, they are passed through an air-heater which transfers about half of this remaining heat to the air supplied for combustion.

The furnaces are constructed of brick, and lined with fire-brick where exposed to high temperatures, the whole being bound together by vertical steel channels connected with tie rods.

The continuous grate usually consists of three or four cells, connected, but having separate ashpits. The roof of the cells is an arch of fire-brick run from front to back wall. In the Meldrum, this arch runs straight from end to end of the cells, but in the Heenan it is forced with undulations, the makers claiming that these undulations cause the gases to be better mixed.

Cast iron fire bars are used, supported upon cast iron frames, the usual provision being made for expansion. The air space between the bars varies from $\frac{1}{8}$ in. to $\frac{3}{8}$ in. for average refuse.

To each of the ashpits is connected a duct, which supplies hot air for the combustion of the refuse and is controlled by a valve or damper actuated from the front of the furnace.

At the front of each furnace a door is provided, through which the firing is done and the clinker removed. There is also another door or opening located at the top or back of each cell. These doors are all made of cast iron and lined with fire-brick. They are suspended by a wire rope passing over two pulleys a balance weight being attached to the other end, thus enabling them to be easily opened. When closed they fit tight, the joint being made of asbestos cord.

The combustion chamber is placed at the end of the continuous grate. It is simply a brick chamber of liberal dimensions, open at one side to the grates and on the other to the boiler. Besides its other uses, this chamber serves to cremate the carcases of horses and other animals, for which purpose a door of suitable dimensions is provided at the front of the chamber.

Boilers now installed for these plants are more often of the water-tube type, and are built up just as they would be for coal firing, except that the grates not being required, are not installed. The hot gases pass in at the side from the combustion chamber and circulate round the settings in the usual way.

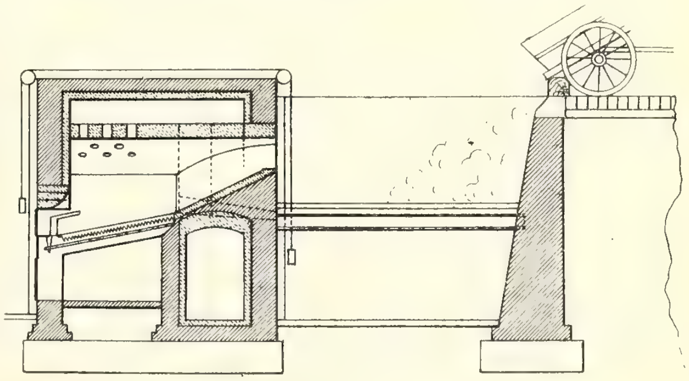

Fig. 2.—Air supplied by a steam jet.

The air heater plays a very important part in these plants, handing back to the furnace a portion of the heat which would otherwise go up the chimney. It consists of a number of wrought iron tubes traversing a wrought iron box. The hot gases pass through the tubes, whilst the air for combustion is drawn over the outside of them.

Air for the combustion is collected in a trough under the roof. It is sucked down a duct by a fan and then forced through the air-heater to the ashpits. In the Meldrum furnace, instead of a fan, steam blowers were used, one being provided for each ashpit.

Factors in Design

The design of an incinerator will depend to a great extent upon the nature of the refuse that has to be burned; therefore a careful examination of the waste should be made. It will be found that there is a considerable difference in its composition and quality as a fuel. The refuse of one district will not resemble that of an adjoining district, and the summer refuse will vary from that of the winter. Where coal is cheap, people are not very careful when cleaning out their fires, with the result that the refuse will be found to be rich in unburned coal. In parts of the world where people are very poor and coal is not extensively used, as, for instance, Bombay, a town in which these conditions are found, every particle of useful material is removed from the ashbins, so that there is little but incombustible material left for the incinerator.

To estimate the heat value of a refuse, it will be necessary to select an average sample, and to do this successfully needs some experience. Have the sample chosen picked over and separated out into its constituent parts. The addition of the heat value of each of the constituents will give the heat value of the whole sample. The calorific value of average refuse containing the usual amount of moisture will be found to be 3,000 B.T.U.

Sand mixed in the refuse will be found to affect the burning of a fire, as the silicate will be fused, and form into a liquid skin or layer which prevents the air being forced through the grates. The peel of some fruits, such as that of the pineapple, when burned in large quantities, gives off an acid that tends to put out the fire.

Selection of a Site

The selection of a site for an incinerator will depend upon local conditions and no definite rules can be laid down. In making a selection it should be born in mind that the cartage is a very heavy item, so that the more central the site the less the cartage will be. Residential property should be avoided as much as possible, and a site selected with plenty of room for the handling of the carts and clinker.

A well-designed modern incinerator can be arranged to consume refuse without causing any smell, smoke, or dust; but there is no getting away from the fact that the fuel these furnaces are burning is at times unpleasant, and this material is being continually carted through the streets approaching the plant, and this must at times prove objectionable to the residents.

The building should be large enough to accommodate the plant and to permit all carts to be unloaded under cover. This prevents any dust escaping and causing a nuisance to the neighborhood. All the approaches should be paved so that they can be washed down regularly.

In Europe the grounds surrounding the buildings have in several instances been planted with trees and shrubs. This has done much to annul the feeling of uneasiness caused by the knowledge of having a plant of this kind working in the district.

Methods of Feeding the Incinerator

Refuse is usually fed into the furnaces by hand, as owing to its variable nature, the problem of feeding mechanically has not been successfully solved. There is however one method known as the "tub system" which has found some success.

For hand-feeding, an aperture is provided either at the top or back of the furnace. The top feed would at first sight appear to be the more convenient, but in practice it is found open to the objections that the aperture is placed at the centre of the roof-arch thus weaking the latter at the point where it is exposed to the greatest heat, and that when the aperture is open the flames are apt to shoot up and inconvenience the firemen.

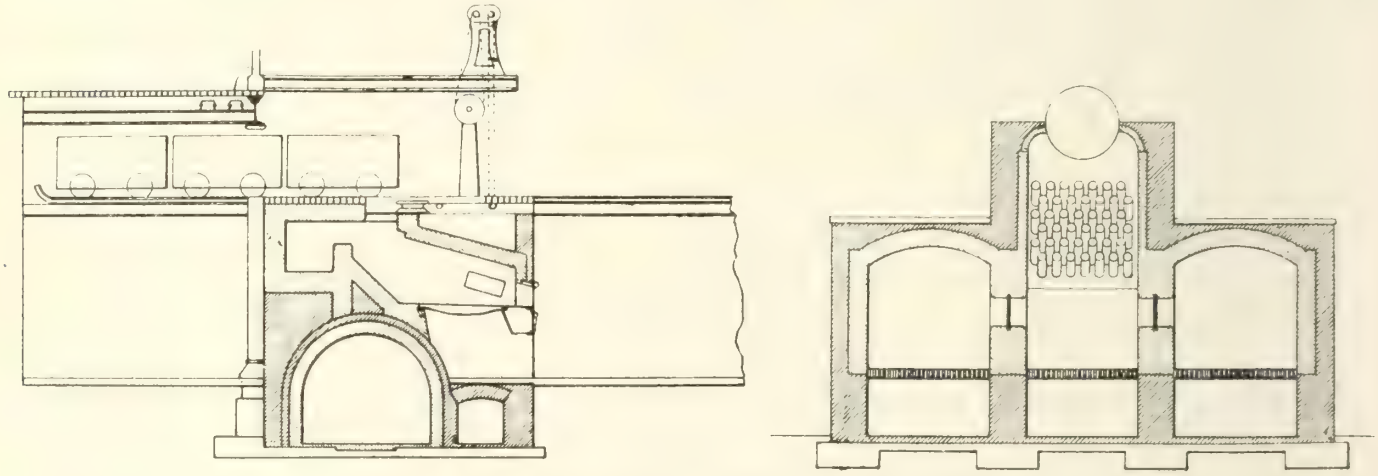

Fig. 3.—Improved design by Messrs. Bulnois & Brodie

In the tub-feed, the refuse is fed into the tubs, which are mechanically lifted up and placed over openings, on the top of the furnace, the furnace door and tub hopper door being then opened together, and the refuse shot into the furnace. The system has the advantage that the operation is done quickly, and the doors are not kept open for very long.

For a small plant of only a single unit a certain number of men are required to attend to it, and as these men can also attend to the feeding of the refuse, it is not often possible to justify the cost of installing any form of mechanical feed in such cases.

The firing and removal of clinker is done from the front of the furnace. The doors for this purpose should be larger than the feeding doors, and the bottom of the door should be slightly lower than the level of the top of the fire-bars. The clinker is removed by hand, drawn into barrows, or on a suspended tray, and conveyed to the dump. It will be found that it can be more readily removed from the fire bars if a small quantity of steam is admitted into the ashpits with the hot air. The exhaust steam from the fan engine will be found sufficient for the purpose.

For hand working it has been found that a cell of about 25 sq. ft. of grate area is most convenient; but for tub feed smaller grates have been tried and found better. As previously explained, the cells are arranged in rows of three or four so as to form a continuous grate, but the ashpits are kept separate as this arrangement enables the air supply to each cell to be controlled. The advantage of the continuous grate is that a more uniform temperature, and thus higher average temperature can be maintained. For instance, in a three cell unit, when one fire is being cleaned theoretically the heat is reduced to 2/3, and in a four cell to ¾. In practice, however, the results are better than this would indicate, because when the fan is cut off from one cell, it tends to force up the remaining ones, thus increasing the temperature. Again after a cell has been recharged, instead of its taking some time to dry, and start burning, it is assisted by the other fires as they soon dry the moisture out of the new and in a very short time the cell is again in full blast.

The quantity of refuse burned will depend upon its nature, as 60 lbs per sq. ft. of grate has been burned, but unfortunately this high ratio cannot be maintained under normal conditions of working, and the quantity will generally be found to average under 40 lbs. per sq. ft.

Temperature to be Maintained

The temperature that must be maintained in the furnace is a very important point. To deodorize the gases, a temperature of not less than 1200 degs. F. will be required. On the other hand a temperature exceeding 2000 degs. F. will be found to be too severe upon the brick lining, and it will also tend to fuse the particles of dust passing over to the combustion chamber. Therefore, for economical working it will be found advisable to attempt to maintain a temperature at a little below 2000 degs. F. as it will then be found, that when a cell is being cleaned out, it will be possible to prevent the temperature falling below the lower limit.

By taking the air supply from a trough at the roof of the building, all fumes escaping from the furnace, or odours from the refuse, are sucked down into the furnace, and as there is an indraught induced at the doors and openings, any unpleasant smell is prevented from getting out of the building.

The fan is capable of delivering the air (which has been heated by the air-heater to a temperature of between 150 and 200 degs. F.) at a pressure which can be varied up to several inches of water.

The draught of the chimney and the fan pressure should be regulated so that the pressure above the grates is the same as that of the atmosphere. If the pressure above the grates be lower than the atmospheric pressure there will be an inrush of cold air every time the doors are opened, and consequently a drop in temperature in the furnace. If the pressure above the grates, on the other hand, be higher than the atmospheric pressure, higher temperatures will be obtained, but every time the doors are opened the flames will shoot out in a way that will be inconvenient to the firemen.

The combustion chamber should be constructed with ample dimensions, to catch the dust and have sufficient depth to hold an accumulation of it. The boilers used may be of the water-tube or Lancaster type. They both have their advantages, but the former seems to be more favoured; it certainly fits in better with the general arrangement, and is easier to clean. On the other hand the Lancaster boiler has a large storage capacity, which is an advantage for incinerator work.

The Foster Superheater has found some favour for this class of work as it consists of a number of cast iron rings shrunk on steel tubes. The cast iron rings store heat and so the superheating does not fluctuate to the same extent as it otherwise would.

Generation of Steam and Disposal of the Clinker

In concluding reference will be made to the steam generating qualities of these plants; and the disposal of the clinkers.

It must be borne in mind that the primary object of an incinerator is to burn the refuse in a sanitary way, and that steam raising, and the quality of the clinker produced are secondary considerations.

Under favourable conditions incinerators have been able to produce over 2 lbs. of steam per lb. of refuse from and at 212 degs. F., but it must not be imagined, from these results, that under ordinary conditions the average output will be nearly so high as it will be found to be nearer ¾ to 1 lb. per lb. of refuse. And when figuring the steam to be expected from a plant, it would be safer to take the lower limit.

One of the drawbacks to the use of the steam generated by an incinerator is the way in which the supply fluctuates. This is particularly noticeable when one small unit is working alone, but it becomes less and less perceptible as the number of units is increased. Another objection is the difficulty of conveniently varying the quantity of steam supplied. As for sanitary reasons the incinerator has to burn the refuse as it is delivered, regardless of the demand for steam, thermal storage has been suggested as a means of overcoming this difficulty but too large an addition to the capital expenditure would thus be involved. Perhaps the most satisfactory way of overcoming the difficulty is to work the incinerator in conjunction with a battery of coal-fired boilers; it is then possible to allow the incinerator to work continuously and to regulate the steam output by means of the coal-fired boilers.

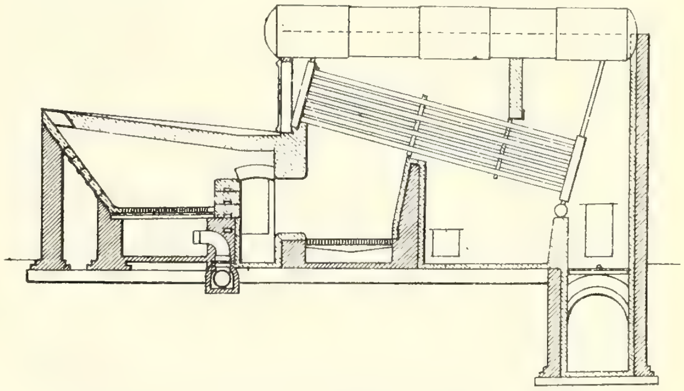
Fig. 4.—Designed by Messrs. Beadman & Deas

In most cities the clinker will be found to be a source of income. The quantity produced will vary from 25 to 30 per cent. of the refuse burned, so that proper arrangements should be made for its handling and storage. Much of it can be sold in the state in which it leaves the furnace, but sometimes it is found better to lay down a small plant to crush and screen it. In other cities it has been found advantageous to lay down a plant to make concrete paving slabs and building blocks.

The most valuable asset in any business or vocation in life is knowledge.

Union of Canadian Municipalities

The Union of Canadian Municipalities is holding its annual meeting at Saskatoon, July 15-17. After the address of welcome by His Worship Mayor Harrison of Saskatoon, and replies by the delegates and the presidential address by His Worship Mayor Lavallee of Montreal, the honorary secretary-treasurer of the Union, Mr. W. D. Lighthall, K.C., presented his report, the substance of which we give below.

In the report it was pointed out that upon the occasion of the previous visit of the Union four years ago, all had been struck with the wonderful prospects shown in the northwest cities. Since that time everything showed that these propects were being realized and now the delegates of the Union had returned to find to a very large extent the full fruition of the promises of the former visit.

Part of the work of the Union of Canadian Municipalities is to try to secure legislation which will prove beneficial to the municipalities. The question arising from the judgment of the Privy Council in the case of North Toronto and the Toronto and Niagara Power Company, which was the subject of one of the principal resolutions of the last convention and involved the great matter of control of streets in general, was the occasion of a large and influential delegation to Ottawa. In reply to the representations of the delegation the Dominion Government promised relief by legislation. Other questions were also involved in the pending revision of the Railway Act. Owing to the prolonged naval debate these questions were forced to stand aside for the time being. The International Municipal League suggested at the Windsor convention has been established and is getting into operation. The Secretary appointed,—the widely known Mr. Clinton Rogers Woodruff, Secretary of the National Municipal League of the United States,—has thrown into the matter all his usual zeal and ability. Several of the principal British Municipal Associations, and those of South Africa, New Zealand and Australia have taken favorable action, and negotiations are in progress with the International Municipal Association of Europe at Ghent this summer.

The secretary further indicated that the Union had taken up the question of the building of an interprovincial highway across Canada. The principal cities and towns are in favor of such a road. The Dominion Government has been approached upon the question and there is no doubt as to its ultimate construction.

The subject of town planning, which was one of the important questions of the day, has also received considerable attention and the establishment of a Dominion Department of Statistics for municipal purposes has also been pressed upon the government.

Other significant features noted in the secretary's report are as follows:

An event of some importance has been the organization of the Union of Quebec Municipalities which is ably officered, and from which good results may be expected. It will hold its regular convention this autumn.

A bill was again introduced into Parliament to prevent pollution of waterways by municipalities. It once more brought protests from Halifax and other maritime places, where its application would be objectionable. Would it not be wise to suggest that the opposing views be brought into harmony by exemption of certain regions or classes of localities? A resolution of this Convention might be of assistance.

The cement duty question came up again and the Union took the same stand as formerly. The government refused any rise in the duty.

A bill to allow the Postmaster General to fix rates of post office carriers on electric railways attracted some attention, being caused by a heavy demand by the Tramways Company in Montreal. But we found that the bill did not apply to municipally owned railways.

The work of our Bureau of Information and of the "Canadian Municipal Journal," our official organ, has been constantly effective.

This being the first of the years of celebration of the Hundred Years Peace, it may be fitting to remark on the propriety of a representative body such as this expressing itself on the subject, since no bodies are more interested in peace than the municipal governments.

The programme, which is one of unusual interest, announces that papers will be read by Mayor Hocken, Toronto, Mayor Short, Edmonton, Mayor Gray, New Westminster, Mayor Graham, London, and Mayor Oliver, Port Arthur. J. M. Bayne, Deputy Municipal Commissioner of Saskatchewan, C. J. Yorarth, City Commissioner of Saskatoon, T. L. Church, City Controller, Toronto, and W. D. Lighthall, Honorary Secretary of the Union, will also discuss questions of vital importance on municipal development in Canada.

Copper Clad Wire Litigation Dismissed

The first judgment in the important litigation in regard to Copper Clad Wire which has been contending in the United States Court in Pittsburgh, Pa., for the past two and a half years between Duplex Metals Company of New York, complainant, and the Standard Underground Cable Company, Pittsburgh, Pa., defendant, was given June 25th when the case came before the court on motion made by complainant to dismiss the bill in respect to Patent Infringement. The bill as originally filed charged infringement of the patent and infringement of a trade mark. The motion made by complainant was to dismiss without prejudice. The motion was opposed, defendant contesting that the bill should be dismissed in this regard and a dismissal should be on the merits of the question. The Court so ordered, the order reading:—

> "Complainant having admitted that defendant's product referred to in the proofs herein does not infringe the Monnot Patent in suit No. 893932 it is ordered adjudged and decreed that the bill of complaint herein, in so far as it is based on alleged infringement of said patent be, and the same hereby is dismissed on the ground that defendants have not infringed said patent."

The Order of the court directs that the complainant pay the costs. The only portion of the suit not thus disposed of is in regard to the right to use the trade name "Copper Clad," and which is expected to go to a hearing in the early fall.

Melbourne Suburban Railways

The Victorian Government, Australia, decided in December, 1912, to electrify the extensive system of suburban railways of Melbourne. The direct current system has been adopted in accordance with the advice of their Consulting Engineer, Mr. Merz, of London, who after thoroughly investigating the tenders submitted for alternating and direct current installations, came to the conclusion that in this case a direct current system would be the most suitable. A 1500 volt direct current system (multiple unit system) with overhead supply has therefore been chosen.

The total length of single track, including sidings to be electrified is about 323 miles.

The order for the machinery for the twelve sub-stations was placed with one of the Siemens Companies, of London, and comprises amongst other apparatus the following machines:—14 rotary converters, 2,000 kw. each; 10 rotary converters, 1,000 kw. each; 4 rotary converters, 500 kw. each, together with the necesary transformers.

The transformers are supplied with 3-phase current at 19,000 volts. The reactance necessary for obtaining the proper regulation of the rotary converters is built in with the transformers.

Six-phase current supplied to the three-phase side of the rotary converters, and on the direct current side current at 1500 volts, is supplied from a single commutator.

Extending Operations

The prosperity of the Standard Clay Products, Limited, with factories at St. Johns, P.Q., and New Glasgow, N.S., is plainly evidenced by their expansion at the latter mentioned city. The accompanying cut is a very good photograph of the plant they have been operating in New Glasgow. It consists of 2 sewer pipe presses, 4 wet pans, 10 kilns, each 34 feet in diameter, a 200 h.p. Corliss engine, three 16 by 6 foot boilers and 2 dry pans. The company is building in New Glasgow an additional sewer pipe plant of greater capacity. The new concern will have 15 kilns, 2 dry pans, four 8-foot wet pans and a 400 h.p. Goldie & McCulloch Corliss engine. The wet pans, sewer pipe presses, elevators and conveyors for this plant were supplied by the Stevenson Company of Wellsville, Ohio.

Plant now operating at New Glasgow.

Sarnia Waterworks

In connection with the recent ceremony of turning the first sod for considerable extensions to the waterworks of the Town of Sarnia, Ont., it is interesting to note that the waterworks commission have finally decided to install steam turbine-driven pumps, after having spent considerable time in investigating all other types, including the vertical high duty type of pumping engine.

The available speed of the pump is 1500 r.p.m., which is fixed by the fact that at some future time it may be required to connect the pump to an electric motor to operate on the Hydro-electric 25-cycle supply. Herringbone gears are used to connect the pump to steam turbine operating at 3600 r.p.m. By using this speed for the steam turbine, 20 per cent. less fuel is used than if steam turbines were run at the same speed as the pump. The gears are of the "Herring-Bone" type which has been used successfully in powers sufficiently large to drive steamships. They are entirely enclosed in a cast iron casing and are practically noiseless.

There are two similar units to be installed. The pumps are of the well-known Mather and Platt stage turbine type, each capable of delivering three thousand imperial gallons per minute against 200 feet head. The complete contract has been placed in the hands of Canadian Allis-Chalmers Limited, and will be manufactured at their Montreal works.

Sixth General Annual Assembly

Calgary, Alta., September 15th and 16th, 1913.

The Sixth General Annual Assembly of the Royal Architectural Institute of Canada will be held at Calgary, Alta., on September 15th and 16th, 1913. A very interesting programme is being prepared which will include matters of interest to every architect in the Dominion. Every Canadian architect is cordially invited and is welcome at all sessions and entertainments, whether a member of the R. A. I. C. or not.

The programme will be sent early in August to all the members of the R. A. I. C. and will contain all the particulars concerning the Assembly. The Committee of Arrangements of the Assembly is composed as follows: J. H. G. Russell, F.R.A.I.C., G. M. Lang, F.R.A.I.C., L. M. Gotch, M.R.A.I.C., W. D. Cromarty, M.R.A.I.C., and Alcide Chausse, F.R.A.I.C.

Mainly Constructional

The News in Brief—From Coast to Coast

An English syndicate has bought a tract of coal lands near Canmore, Alta., amounting to 8,000 acres, at a cost of about $2,000,000.

A large force of workmen is engaged on the construction of Manitoba's agricultural college, and the exterior of some of the buildings is now nearing completion.

The construction of the Thorold section of the Welland Ship Canal will necessitate a diversion of the Grand Trunk Railway, for which room will have to be made on the west side.

Mr. Michael Sullivan, of Kingston, has been awarded the contract for the construction of the new military barracks at Long Branch, Toronto. The contract price is $644,000.

Rapid progress is being made in the erection of the new grand stand and main building at the Exhibition Grounds at Regina and prospects are that both will be finished in good time for the fair.

The Council of Westmount, P.Q., have made a beginning with a system of conduits for electric lighting. A contract has been let to Messrs. R. T. Smith & Company for laying a section of the conduits.

An addition of 250 feet is to be made to every pier at the west end of Montreal harbor. This will furnish accommodation for eight more steamers. The work will probably cost over a million dollars.

Negotiations are said to be under way for the purchase by an English syndicate of the Traders Bank building, at the corner of Yonge and Colborne streets, Toronto, at a price in the neighborhood of $1,250,000.

The Good Roads Year Book of the United States has just been issued. It contains a review of the whole road situation and indicates that there are upwards of $400,000,000 of good road bonds outstanding.

The Maritime Nail Company, of Fort William, states that construction on their proposed $700,000 plant will be commenced in a short time, and that the building should be well under way in the course of a couple of months.

An appeal is to be made in the cases of Messrs. Paradis and Trudel, who were ordered by the Superior Court, Montreal, to pay $1 each to the Association of Architects of the

Province of Quebec as a penalty for practising architecture without having been duly admitted members of the association.

The British American Nickel Corporation, Limited, of Toronto, has been incorporated with $20,000,000 capital. The company is authorized to acquire and develop nickel, gold, silver, copper, coal, salt, iron, and other mines.

The historic Roman Catholic Church of Saint Charles, in Centre street, Montreal, was burned to the ground on July 5th. The church was one of the oldest in the city and contained several valuable paintings. The loss amounts to $200,000.

It is expected that the city council of St. Thomas, Ont., will shortly secure estimates for a steam plant and an alternating current dynamo to supply customers who are suddenly deprived of the Hydro current, upon which they now rely absolutely.

The deal for the purchase of the Carling Block, London, Ont., for a post-office site was closed recently, the executors of the Carling estate accepting $140,000 for a frontage of 142 feet on Richmond street, and a depth of 144 feet on Carling street.

The John S. Metcalf Company, Limited, Montreal and Chicago, constructing engineers, has been awarded the contract for the re-building of the Roman Catholic Cathedral of Charlottetown, Prince Edward Island, destroyed by fire some months ago.

The former walls, which are partially standing, will be used as far as possible; and in the design for the re-building fireproof features will be incorporated. The estimated cost of work is approximately $150,000. The same company has received, from the C. P. R., a contract for extensive work in connection with the steel river house at elevator "D," Fort William, Ont. The cost is estimated at $45,000.

The Dominion Government has appointed Prof. C. D. Howe, of Dalhousie, N.S., supervising engineer of the grain commission. Mr. Howe has been professor of civil engineering at Dalhousie University and the appointment meets with general approvement.

A. S. Porter, a prominent citizen of Regina, and owner of very extensive coal lands in the southern part of the province, is organizing a company to be capitalized at $1,000,000, to generate power from the lignite coal deposits on Mr. Porter's property.

Mr. E. G. M. Cape, Montreal, has obtained the contract for constructing the first building of the steel plant of the Armstrong, Whitworth Company, at Longueuil, P.Q. It is intended to afterwards enlarge the plant, at which all kinds of steel work will be manufactured.

In another attempt to secure the old court house site as an open space for the city of Vancouver, the city council recently determined to re-open negotiations with the Provincial Government, portending either to making a trade or a cash offer of $500,000 for the land.

Favorable progress is being made on the new Y.M.C.A. building on College street, Toronto, which, when finished, will be the most up-to-date in the Dominion. The contractors are hopeful that the work will be completed in time for the proposed opening about September 15th.

A new hotel, to cost $300,000, is likely to be built at the Thousand Island Park, N.Y., to replace the hotel burned a year ago. The company putting it up will be distinct from the Park Association. The hotel will be fireproof, and will be placed nearer the river than was the old hotel.

The extension of all the piers in the harbor undertaking which may cost over $1,000,000, at Montreal, and which will consume the greater part of three years, is to be assumed by the Harbor Commissioners, according to an announcement made at the offices of the board recently. For several seasons complaints have been laid by the shipping companies and others interested that great inconvenience and often danger has been incurred by ocean-craft jutting out beyond the end of the piers. Several times this year collisions which only a good fortune saved from being serious have occurred.

The report of Dr. Hastings, M.H.O., of Toronto, for June, states that the test of the combination of mechanical and slow sand filtration at West Toronto, shows that the system "will be able to stand comparison as regards efficiency with any other known type of mechanical filter."

Work has been started on New Westminster's harbor improvement scheme, a building permit having been issued to the city, through Harbor Engineer A. O. Powell, to build a cedar pile quay wall on the fore-shore at a cost of $102,000. Messrs. Waugh, Meisner & Bailey, of Vancouver, have charge of the work.

The City of Montreal have for a long time been negotiating for the purchase of the plant of the Montreal Water and Power Company. The latter have now offered to go to arbitration as to the price to be paid. Originally the company wanted seven million dollars, but the city refused this on the ground that it was too high.

Investigation of the water-power resources of British Columbia for the Commission of Conservation at Ottawa is being continued by Arthur V. White, of Toronto, consulting engineer on water powers for the commission. Mr. White has with him on his expedition two engineers, C. J. Vick and Napier Simpson, both of Toronto.

The first concrete chimney to be erected in the maritime provinces is now in course of construction at West St. John, N.B., for the new C. P. R. elevator. This chimney, which will be 13 feet outside measurement at the base, will taper to 7 feet at the top and will be over 220 feet high. There is no doubt that the elevator will be ready for grain this fall.

A large block of property at Toronto, consisting of twenty-four houses and having a frontage of 400 feet on Richmond street and 200 feet on Portland street has been purchased by Pilkington Bros., Limited, whose head office is at St. Helen's, Lancashire, for a site for a large plate glass factory. The consideration for the whole parcel was $115,000.

It is reported that the Pacific Great Eastern Railway, whose bonds are guaranteed by the provincial government to build from Vancouver to Fort George, will immediately commence work in North Vancouver. The railway already has a thousand men working on the grade fifty miles north of Vancouver. Foley, Welch and Stewart are the contractors.

On the ground that the firm offers the most superior pipe, the city council, Calgary, acting on the recommendation of Commissioner A. G. Graves, supported by Water Engineer A. Ellison Fawkes and City Engineer G. W. Craig, voted Monday to award a contract to the General Supplies, Limited, for putting the new high pressure main under the Elbow river.

Plans for the new government-owned interior storage elevators which are to be built at Moose Jaw and Saskatoon, it is understood, will be ready within another week and tenders for construction will be called for immediately. The new elevators, which will hold from three to four million bushels, and will cost around a million each, will be under the supervision of the grain commission.

Plans are being prepared for a modern office building for the Molsons Bank, to replace the old three-storey structure now occupied by the bank on the southeast corner of Main street and Bannatyne avenue, Winnipeg. It is not yet known whether the new Molsons Bank will be six or ten storeys high, but it is understood that excavations will be begin this fall, and work on the superstructure commenced next spring.

With the filing on July 3rd at San Francisco of an application for a permit to construct a cottage, building applications since the fire of 1906 reached a total of approximately $400,000,000. This is in rough figures the amount of the city's loss of property in that disaster. The above application is numbered 50,000, the series dating from the first one issued after fire destroyed a large part of the city.

Messrs. P. W. St. George, J. A. Jamieson and F. A. Barbour, the experts appointed by the city of Toronto to examine the site of the filtration plant, have completed their report, and will place it in the hands of Mayor Hocken within the next few days. Already the general conclusions have been received at the City Hall, but it is said that the full text will not be made public.

Plans have been prepared and a permit is being issued for a new vaudeville theatre, at Winnipeg, which is to be erected at a cost of $180,000 for the Pantages circuit, an organization which has its headquarters in Seattle, and which has a big string of theatres in the western states. The site chosen is on the south side of east Market street, just east of the Iroquois Hotel. Work upon the excavation has already been commenced.

Tenders for the new $3,000,000 Provincial Legislature buildings were opened this morning at a meeting of the cabinet. But two firms are tendering, Peter Lyall Construction Company, Limited, Montreal and Winnipeg, and Thomas Kelly & Sons, Winnipeg. In view of the huge nature of the undertaking it was decided to submit the tenders for consideration to F. W. Simon, architect of the buildings and V. W. Harwood, provincial architect, for their report.

The Montreal Water and Power Company has still failed to submit the required particulars of its plant to the city. Some weeks ago the city notified the company that a delay till June 20 would be granted to allow the particulars to be filed, otherwise the property of the company would be expropriated ward by ward, beginning with St. Henri Ward. The June 20 came and went. No particulars were filed; and nothing definite was done by the way of expropriation.

Winnipeg has permanently reached the end of its water troubles so far as the supply is concerned. The pipe line is laid to the three new wells which are located from six to eight miles northwest of the city, and when they get into operation, Winnipeg will be pumping water from eleven wells. The eight wells at present in operation are pumping from 8,000,000 to 9,000,000 gallons of water a day, so that in two weeks this supply should be increased to over 12,000 gallons daily.

The city has struck water in eight other wells on the line to Poplar Springs, and the pumping machinery will be installed in all of these wells this fall, making a grand total of 19 wells in operation. The new 18,000,000 gallon reservoir will also be ready this fall.

The contract for the construction of the new filtration plant at Edmonton was awarded recently to the New York Continental Jewel Filtration Company at a price of $117,000. The work on the system will be started as soon as the contracts have been signed. The company will guarantee to have it completed and in operation on April 15, 1914. It will also guarantee that the plant will give a bacterial efficiency of not less than 97 per cent., and that the filtered water will be bright and clear and perfectly free from color turbidity.

Another international question, reopening the rather vexed issue of a division of international water powers, is involved in an application received by the Government from the Michigan Lake Superior Power Company. What is sought by the company is the privilege of damming St Mary's River at Sault Ste. Marie in order to increase the flow of water to the works of the Michigan-Lake Superior Company at the American Soo. Compensating works to prevent the levels of Lake Superior being injuriously affected are proposed. The application is accompanied by plans and profiles of the proposed work, and the compensative undertakings in connection with it. The matter doubtless will go to the Waterways Commission for full investigation.

Construction of what it is stated will be the only powder factory in the interior of British Columbia has been commenced on a 15-acre site at Granite, purchased by the Kootenay Explosives Company, Limited, which has been organized by Nelson business men to produce XL-Ite blasting powder, for which the Canadian rights have been secured by the company. Two hundred thousand dollars is the capital of the company, and its officers are: President, William Gosnell; vice-president, A. C. Towner; secretary and manager, F. E. Ransome; executive, George F. Motion, H. D. Farris.

The officers of the Department of Public Works are figuring out the lengthy schedules of tenders for the construction of the big dry dock at Levis, of which the estimated cost is $4,000,000. The tenders are not in bulk, but comprise 85 separate items. No report has yet been made, but when it is it will be confidential to the Government. It is learned that bids have been put in by very large firms of which the principal are Sir John Jackson and S. Pearson and Sons, big English contractors, M. P. Davis, of Ottawa, M. J. O'Brien, of Montreal, and a Quebec syndicate. It is probable that the contract will be awarded soon, though it may be delayed till the return of the Hon. Robert Rogers.

Canadian Railroad Development

Work on the Hudson Bay Railway is being rushed by the J. D. McArthur Company and the Hudson Bay Construction Company as rapidly as the conditions of the country through which the line passes will permit.

Before winter the C. P. R. will be running a double track service between Toronto and Guelph Junction, a distance of thirty-one miles, and next year will see another lap covered on the way to Windsor, 189 miles further west.

Work has commenced on extensive additions to the C. P. R. yards, Moose Jaw, Sask. Trackage in the west yards is being increased by approximately fifteen miles, which necessitates the construction of five culvert bridges.

About 4,000 men are at work on the Transcontinental line from Cochrane to Quebec city. The gap remaining to be completed is about twenty miles in length, but as there is some grading, the last rail uniting Cochrane with Quebec will not be laid probably until September. The entire line will be ready for traffic, both passenger and freight, during the month of November.

The Toronto and Eastern Radial line from Bowmanville into Toronto, will be ready for full operation early next spring. The grade between Bowmanville and Pickering will be completed shortly, and four hundred men will be set at work on the grade from Pickering west of Toronto. The steel is already laid from Bowmanville, half a mile west, and a large force of men are now to be placed on laying the steel between there and Pickering.

Work on the new C. P. R. bridge across the St. Lawrence is being pushed ahead. A little foundation work has still to be completed before the two 408-feet channel spans are launched, but this will be done before the first of these two is ready for swinging. The Dominion Bridge Company are busily engaged in erecting the first of these huge spans on the bridge, and it is expected that it will be ready to be put into place in about two months.

It is expected that the C. P. R. will construct in the near future a line connecting Saskatoon with Calgary via Milden and Empress. This line when compelted will open up a large territory and will parallel the C. N. R. Goose Lake line for a considerable distance.

The work of construction on the missing link of the Kootenay Central branch of the Canadian Pacific Railway is being pushed ahead by Messrs. Burns and Jordon, the contractors for the construction. Two of their steam shovels were brought in by boat recently and have been unloaded and set to work at intervals along the shores of Windermere Lake.

The Canadian Pacific Railway has obtained from the Minister of Railways and Canals the approval of a branch running from Snowflake in southern Manitoba, in a straight line westerly for 9 miles. This line will extend to a point about 9½ miles southeast of Crystal City. The application was granted without demur. Approval was given to the proposed extension of the Canadian Pacific from Gimli to Icelandic River, a distance of 26 miles.

Regulations with respect to railway safety appliance standards, designed to ensure trainmen against accident in the discharge of their hazardous duties, were issued by the Railway Commission on July 9th. They standardize safety appliance equipment to conform to the requirements of the United States Inter-State Commerce Commission. All railway companies in Canada must complete by December 31st, 1915, the work of reconstructing and standardizing their equipment.

Mr. J. W. Eber, General Superintendent of the T., H. & B. Railway, announced recently that that company would not join with the G. T. R. and C. N. R. in a common route scheme for Hamilton, and that the city could not offer any inducement that would cause it to do so. It has been the hope of the city officials that this company might agree to this proposal and thus solve the difficulty that has been met in connection with railways in this city. Hamilton will now wait to see what move the company may make regarding grade separation for the line.

The Canadian Pacific Railway have awarded a contract to the John S. Metcalf Company, Limited, Montreal and Chicago, for the construction of all the buildings along the new line of the C. L. O. & W. Railway, about 180 miles in length, extending from the present main line at Glen Tay, Ontario, near Smith's Falls, to the main line at Agincourt, not far from Toronto. The contract includes seven brick stations, twelve wooden stations, nine 40,000 gallon water tanks, a twelve-stall engine house with turntable, machine shop, coaling plant, ash pit and sand house; nine freight sheds, an ice house, seven station residences, twenty-five tool houses, and miscellaneous buildings. These make a total of about eighty-five structures. Work on the new line is progressing rapidly under the direction of C. W. P. Ramsey, Engineer of Construction, and it is the intention to have all the buildings ready for use by the end of the present year.

A $40,000,000 subway loan is to be permitted the city of Philadelphia by a legislative enactment recently passed by the Pennsylvania senate authorizing the return of all personal tax to counties and the use by Philadelphia of this resource as the basis of such a loan. The conference report was adopted, at the same time empowering the city to build, lease and operate subways and extending the time limit for starting work eighteen months. Both bills now await only the governor's signature to become laws.

Personal Mention

Messrs. Bovell & Molesworth, architects, have removed their office from Yonge street, Toronto, to Room 15 No. 2 College street.

Mr. R. B. Whitten, and Mr. Geo. A. Oman, architects, have formed a partnership under the firm name of Whitten & Oman, with offices at 413-415 Lougheed Building, Calgary, Alta.

Messrs. Mallory & Thatcher, architects, have dissolved partnership. Mr. J. A. Thatcher will remain in the present office, Room 24, 31 Queen W. Mr. W. H. Mallory is located in Room 25 of the same building.

Mr. Alexander Gray, Assistant Engineer of the Dominion Public Works Department, in charge of the Upper Ottawa Storage Dams, arrived recently at Liverpool. Mr. Gray is on a holiday trip in Great Britain and is accompanied by his wife and family.

Mr. W. A. Duff has been appointed chief engineer of bridges for the Intercolonal Railway. Until recently Mr. Duff, who is a graduate of the department of civil engineering of the University of Toronto, occupied the position of assistant bridge engineer for the Transcontinental Railway.

New Water Power Commission

The Dominion Government has decided upon the appointment of the new commission to be known as the St. Lawrence and Great Lakes Commission. The work allotted to this new organization is the study of the whole field of water power development from the head of the lakes to Montreal. It is expected that the commissioners will be Professor McLeod, of McGill University, Mr. Arthur Surneyer of Montreal, and Mr. C. R. Coutlee, of the engineering staff of the Dominion Department of Public Works. Another commission is already at work studying the St. Lawrence water powers below Montreal and will report to the Department of Marine & Fisheries. The work of the new commission will extend over a number of years and may lead to the establishment of a permanent water power bureau to which the government can go for expert information in connection with water power applications. Its reports will also be available for the work of the Canadian section of the International Joint Commission. This latter body is frequently called upon to deal with important technical questions, upon which there is little up-to-date information from the Canadian standpoint.

Grape seed oil is prepared in certain parts of France, Italy and Germany. That obtained cold from the first pressing is palatable; the oil obtained by pressing and heating, and that extracted by means of solvents, have a dark colour and a bitter taste, and after being purified by concentrated sulphuric acid and cleared with bone black, are used for lighting purposes and in the manufacture of soap; and, on account of the small cost, would, it is said, be a good substitute for the expensive oils used in the textile industry. Apart from the uses mentioned, and because some of its chemical properties are similar to those of castor oil, grape seed oil has suggested itself as a substitute for castor oil in the preparation of compounds used in the manufacture of red colors. It may be estimated that, on an average, the fresh refuse of the grape contains 25 per cent. of seeds. According to the variety of the grapes and their degree of ripeness, the quantity of oil which can be obtained from the seeds varies from 6 to 20 per cent.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Waterworks, Sewerage and Roadways

Brampton, Ont.
Sewage and drainage system, for Town Council. Clerk, W. H. McFadden. Engineer instructed to prepare plans for system north of Dale Estate.

Esquimalt, B.C.
Sewage system. Ratepayers passed by-law appropriating $400,000 for installation of a sewage system. Clerk, Thos. Shepherd.

Galt, Ont.
Extension to waterworks for Town Council. Clerk, Jos. McCartney. Ratepayers passed by-laws for $70,000 for extension to waterworks system and trunk water main.

Harriston, Ont.
Retaining hall for County Council. Reeve, Mr. Fox, Drayton, Ont. Cement construction, 70 ft. long.

London, Ont.
Abattoir equipment for City Council, Board of Health. Medical Health Officer, Dr. Hutchison.

Paving for City Council. Mayor, C. M. R. Graham. Chairman Board of Works, B. W. Bennett, 368 York street. Engineer, W. N. Ashplant. Reinforced concrete, block paving on Marley Place, $4,000. Reinforced concrete, block paving on Duchess Ave.

Niagara Falls, Ont.
Pavements, cost $27,000, 4th avenue and Jepson street, for City Council. Clerk, W. J. Seymour. City Engineer, F. J. Anderson.

Newmarket, Ont.
Water supply, cost $20,000, for Town Council. Clerk, J. E. Hughes. Committee appointed. Mayor, J. A. W. Allan. Reeve, Wm. Keith. Councillors, Boyd and B. W. Hunter. Plans ready.

Ottawa, Ont.
Lavatory, cost $15,000, City Hall Sq., for City of Ottawa. Mayor, Mr. J. A. Ellis. City Engineer, Archibald Currie. Underground lavatory, male and female apartments, wash rooms, also shine and telephone booths.

Owen Sound, Ont.
Storm sewers for Town Council. Tenders received by Chairman Board of Works, J. E. Woolrich, until August 1st.

Peterboro, Ont.
Pavement, Hunter, for City Council. Engineer, R. H. Parsons. Bitulithic or asphaltic concrete pavement, distance of about 4 blocks.

Toronto, Ont.
Street grading, cost $9,755, for Board of Control. Mayor, H. C. Hocken, City Hall. The Commissioner of Works recommends 42 ft. roadway on Oriole Parkway from College View Ave. to Eglington Ave.

Cement, concrete sidewalks, cost $26,813, for Board of Control. Mayor, H. C. Hocken, City Hall. The Commissioner of Works recommends construction of a number of sidewalks.

Pavements, cost $105,431, for Board of Control. Mayor, H. C. Hocken, City Hall. Above is recommended by Commissioner of Works. Materials, asphalt, concrete.

Waterworks system, Yonge St., for Board of Control. Mayor, H. C. Hocken, City Hall. City are planning a water system for the Industrial Farm. Sewage system is also under consideration.

Pavements, cost $25,166, for Board of Control. Mayor, H. C. Hocken, City Hall. Asphalt on Mountnoel, Mountalen and Mountjoy streets. Bitulithic on Arlington, Wineva and Williamson road.

Windham Twp., Ont.
Drains, cost $2,662, for Twp. Council. Clerk, J. T. Camfield, Windham Centre, Ont. By-law passed by Council.

CONTRACTS AWARDED

Montreal, Que.
Machinery for Board of Commissioners. Secretary, I. N. Senecal. Contracts for fixed concrete plant recommended to be given to the Bitulithic Paving Company, Room 1, 745 St. Catherine St. W., and for movable plant, to F. D. Cumner & Co., Cleveland, Ohio.

Ottawa, Ont.
Paving for City Council. Mayor, J. A. Ellis. Engineer, Archibald Currie, City Hall. Pavement on Albert St. awarded to Ottawa Construction Co., Central Chambers, Elgin St., $25,000. Asphalt pavements on Blackburn and St. Andrew Sts,, awarded to Union Construction Co., Bank St.

Stratford, Ont.
Main sewer, cost $12,270, for City Council (Board of Works). Clerk, R. R. Lang. Chairman of Board, Ald. Paul. Engineer-in-charge, A. B. Manson, City Hall.

St. John, N.B.
Sewerage system, Lancaster Parish, for County Council. Chairman of Sewerage Board, Wm. Golding, gas lighting, 58 Harding St., Fairville.

Stamford Twp., Ont.
Cement sidewalks, cost $4,500, for Twp. Council. Clerk, C. F. Munro, Southend. Engineer-in-charge, J. C. Gardner, Niagara Falls, Ont. General contractors, McRae & Campaigne, Niagara Falls.

The Pas, Man.
Sewer pipe for Town Council. Sec.-treas., H. H. Elliott, M.D. Con. Engineers, Murphy & Underwood, Ross Block, Saskatoon, Sask. General contractors, Hurst Engineering & Construction Co., 406 Ashdown Bldg., Winnipeg, $76,920.

Laying steel pipe for Town Council. Sec.-treas., H. H. Elliott, M.D. Con. Engineers, Murphy & Underwood, Ross Block, Saskatoon, Sask. General contractors, Murphy & Williams, Fort William, Ont.

Toronto, Ont.
Sewer, $898, Russell Hill Road, for York Twp. Council. Clerk, W. A. Clarke, 40 Jarvis St. Engineer, Frank Barber, 57 Adelaide E. General contractor, W. E. Taylor, 122 Yorkville. Several sidewalks are contemplated.

Railroads, Bridges and Wharves

Calgary, Alta.
C. P. Rly. Co. has been authorized to construct branch lines for B. Burns & Co., Calgary.

Earlton, Ont.
Station for Tamiskaming & Northern Ontario Rly. Chairman, J. L. Englehart, 25 Toronto St., Toronto. Will replace station destroyed by fire.

Hamilton, Ont.
Toronto, Hamilton & Buffalo Railway Co. has been authorized to construct spur crossing Hamilton Radial Electric Railway and Burlington street.

Havelock Sub.-Div., Ont.
C. P. Rly. Co. has been authorized to construct bridge over Salmon River near Ardendale, Ont.

Lisle, Ont.
Bridge abutments for Twp. of Tossorontio. Tenders received by Clerk, Thomas Irwin, Lisle, until July 24th, for concrete abutments and wing walls for steel bridge over Boyne River.

Medicine Hat, Alta.
Canadian Pacific Railway Company has been authorized to construct spur for Benjamin S. Spaulding.

Montreal, Que.
Alterations to Windsor station entrance, Windsor St., for C. P. R. Architect, C. P. R. Engineering Office, Montreal. General contrs., Geo. A. Fuller Co., Ltd., 210 Read Bldg. Tenders received by General Contractors.

Oshawa, Ont.
Station, Centre, for C. P. R. Architect, Company's architect.

Portage la Prairie, Man.
Canadian Pacific Railway Company has been authorized to construct extension to existing siding for A. Snyder & Co., Ltd. in Lot 69, Portage la Prairie.

Prince Albert, Sask.
Stations and buildings for C. N. Ry Div. Engineer, J. A. Crawford, Saska-

toon. Station buildings will be erected west of Prince Albert at Talmon, Balloch, Redberry, Hafford, Speers, Richards and Lilac. Plans ready.

Province of Ontario
C. P. Rly. Co. has been authorized to construct bridge No. 10.7 near Asphodel Station, and Bridge No. 30.8 near Kendry Station.

Simcoe, Ont.
Alterations to railway yards for G. T. Rly. Engineer-in-charge, Leslie Stone, London, Ont. Plans in progress.

Toronto, Ont.
C. P. Rly. Co. authorized to construct extension to existing spur for R. Home Smith, in lot 10, Con. C., Co. York, Twp. Etobicoke, Ont.

Bridge, Gerrard, for Board of Control. Mayor, H. C. Hocken, City Hall. Commissioner of Works, R. C. Harris has submitted new design showing 3 arch spans instead of 1 as originally designed.

Vancouver, B.C.
Wharf for Dom. Government, Dept. of Public Works. Tenders received by Secretary, R. C. Desrochers, Ottawa, until August 21st. Plans at office of C. C. Wolrfold, New Westminster. J. S. Maclachlan, Victoria, J. G. Sing, Toronto and Postmaster, Vancouver.

CONTRACTS AWARDED

Prince Rupert, B.C.
Dry dock buildings for G. T. P. Rly. Co. General contractors, J. F. Wineland Bldg. & Constr. Co., 402 Abbott St., Vancouver. Engineer-in-charge, J. S. Pearce. Power house, 104 x 148, ship building shed, 160 x 300, boiler house and blacksmith shop, 76 x 150, structural steel and concrete, 1 each 10 x 15 ton travelling cranes, 6-400 h.p. water tube boilers, automatic stokers; 5,000,000 ft. of lumber will be used.

Unionville, Ont.
Bridge, cost $1,466, Eckhardt Bridge, for York County Council. Clerk, R. W. Phillips, 57 Adelaide St. E., Toronto. Engineer, E. A. James, 57 Adelaide E., Toronto. General contractors, Lewis Construction Co., Manning Chambers, Toronto.

Wellington Co., Ont.
Bridge for County Council. Concrete work, Cole & Bryson, Owen Sound, Ont., $1,000. Steel work, Welland Steel Co., Welland, $3,600. Bridge on line between Minto and Normanby Twps.

Public Buildings, Churches Schools, etc.

Cottam, Ont.
Hall, cost $5,200, for Cottam Orange Lodge. Interested, Rev. Wm. Sterling. Two storeys, white brick construction. Plans in progress.

Charlottetown, P. E. I.
Interior alterations to post office, cost $15,000, for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Concrete floors, elevators, dumb waiters. Plans in progress.

Essex, Ont.
Addition to registry office, cost $5,000, for Town Council. Mayor, Dr. Bowie. Clerk, Geo. E. Wightman. One storey.

Hespeler, Ont.
Addition to church, cost $4,000, for Lutheran Church. Pastor, Rev. O. Lincke, Waterloo. White brick construction. Plans ready.

Ingersoll, Ont.
School, for Town Council. Clerk, W. A. Smith. Domestic Science & Manual Training School. Plans to be called for.

London, Ont.
Domestic science and manual training equipment, Chesley Ave School, for Board of Education. Secretary, R. M. McElheren, City Hall.

Boys college, cost $125,000, Sunshine Park, for R. C. Diocese of London. Interested, Bishop Fallon. Brick, ornamental stone, cement and steel construction. Plans ready.

Convent for Ursiline Sisters (Mother Van Antwerp, Sacred Heart Convent, London). Site has been purchased.

Furnishings, $15,000, for Ursiline Sisters, (Mother Van Antwerp, Sacred Heart Convent, London). Sisters contemplate remodelling seminary and will require furnishings.

London Twp.
School, Dundas St. E., for Trustees S. S. No. 23. Sec., J. Randall, Pottersburg P.O. One storey, 36 x 36, white brick construction. Tenders received by Architect, A. E. Nutter, Dom. Bank Bdg., London, until July 26th.

Montreal, Que.
School, Poupart, for R. C. School Commissioners, c/o W. Lafontain Com. Academy, 86 St. Catherine W. Architects, Venne & Labelle, 5 Beaver Hall Sq. Tenders are postponed until end of July.

Manitou, Man.
School for Manitou Consolidated School District. Sec.-treas., R. A. McIntosh. Architect, W. A. Elliott, 116 11th St., Brandon. Eight rooms, 2½-stys., brick and stone construction.

St. John, N.B.
Tuberculosis hospital, cost $25,000, Merritt, for Board of Hospital Commissioners. Chairman, H. B. Schofield, City Hall. Architect, F. Neil Brodie, 62 Princess St. Tenders will be called shortly.

Observatory, cost $25,000, Douglas Ave., for Dom. Govt. Meteorological Service. Architect, Garnet Wilson, 50 Princess St. General contractors, British-American Constr. Co., Ltd., c/o P. I. Ligon, Prince William St.

Sandwich, Ont.
Addition to registry office, cost $15,000, for Essex County Council. Clerk, J. Milne. One storey, 46 x 40, stone construction.

Toronto, Ont.
Club house, cost $20,000, Western Channel Site, for National Yacht Club, foot of Bathurst St. Secretary, Thos. Turrell. Plans approved by Harbor Commission.

The following will shortly have to move their club buildings to the Western Channel Site:—Queen City Yacht Club, Toronto Rowing Club, Argonaut Rowing Club and Toronto Canoe Club.

Uxbridge, Ont.
Church decoration, for Methodist Ch. Congregation. Committee, F. Dobson & Sharpe. Tenders received until July 19, for renovating interior of church.

Ville Marie, Que.
Vault for registry office for Municipal Council. Tenders received by Sec.-Treas. of above Municipality, until July 31st. Plans and specifications at office of Sec.-Treas.

Victoria, B.C.
School, cost $50,000, Chandler Ave., for Board of Education. Sec., W. T. C. Pope, 1127 Catherine St. Architects will have till July 23rd to prepare plans. Mill construction.

Windsor, Ont.
I. O. O. F. hall, cost $35,000, Wyandotte, for I. O. O. F. Lodge. Architects, Crane & Pennington. Time extended for receiving tenders to July 19th.

CONTRACTS AWARDED

Bracebridge, Ont.
Post office, cost $35,000, Manitoba, for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa, Ont. Builders, The Simcoe Construction Co., 16 King W., Toronto. Three storeys, structural steel and pressed brick construction.

Edmonton, Alta.
Church, cost $70,000, 23rd St., for Robertson Presbyterian Chuch. Pastor, Rev. D. G. McQueen, 408 4th St. General contractor, Robert Grant, 1626 Jasper Ave. W. 96 x 135, brick and artificial stone construction.

Hagersville, Ont.
Extension to church, cost $6,500, for All Saints Church Congregation. Pastor, Rev. H. J. Leake, M.A. General contractor, John Thew, Welland.

London, Ont.
Alterations to civic offices, cost $6,000, Dundas street, for City Council. Mayor, C. M. R. Graham. Engineer, W. N. Ashplant. Mason, Northey & Tulett, $3,360. Plumbing, T. L. Partridge, $2,760.

Medicine Hat, Alta.
Fire Hall for City Council. Clerk, H. Baker. Architect, J. W. Davey, Building Inspector. General contractors, Sackrider & Turner, Main and S. Railway Sts. Will erect fire hall at 3rd ave. and East Road allowance.

School, Elm street, for Public School Board. Architect, W. T. Williams, Porter Block. General contractors, Sackrider & Turner, Main and S. Railway streets. Two storeys, brick and stone construction.

Ottawa, Ont.
School, cost $140,000, Rosemount, for Public School Board, Elgin St. Architect, W. B. Garvock, Creighton St. School. Ventilating, Canadian Sirocco Co., Ltd., McDougall and Banwell Sts., Windsor, Ont.

Home, cost $27,000, Turner, for Home for Friendless Women, Mrs. Geo. Greene, 320 Waverly. Architect, C. J. Burritt, 193 Sparks St. Carpenter, Taylor & Lackey, 21 1st Ave. Painting not let yet. Three storeys, solid brick construction.

Orillia, Ont.
Armory, cost $25,000, West St., for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractors, E. Webb & Son. Two stys., brick and Longford stone construction.

Regina, Sask.
Assembly Hall, cost $20,000, Broad, for Salvation Army. Builder, A. McBain. Two storeys, brick construction.

Strathroy, Ont.
Hospital, cost $8,480, for Hospital Trust. President, W. P. Dymond, Campbell St. General contractor, R. W. Nicholson.

St. John, N.B.
Alterations to club house, Wellington Row, for Elks Club, c/o H. J. Fleming, 130 Pond St. Mason, A. R. C. Clark & Son, 51 Water Street. Architect, F. Neil Brodie, 42 Princess street.

Regina, Sask.
Grand stand, $20,000, Exhibition Grounds, for City of Regina. Architect, Storey Van Egmond, Credit Foncier Bldg. General contractor, J. Y. Graub. Two storeys, 79 ft. 6 in. x 192 ft. frame construction.

Toronto, Ont.
Military barracks, cost $644,000, Long Branch, for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa, Ont. General contractor, Michael Sullivan, Kingston, Ont.

Montreal, Que.
Post office fittings, St. Lambert, for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Architect, A. Venne, 76 St. Gabriel, Montreal. General contractor, E. Patenaud, 1289 St. Denis.

Church, cost $62,000, Hogan, for Fabrique St. Anselme, 350 Forsyth St. Architects, Viau & Venne, 6 St. Gabriel. General contractors, mason, carpenter, painting, iron and steel, E. N. & M. Boileau, 34 Garnier. Roofing, heating, plumbing and electric, Tremblay & Francoeur, 292 St. Denis. One storey, 160 x 133.

Army hall, City Hall, for Salvation Army, 341 University. Builders and masons, Reid, McGregor & Reid, 14 Guy Block. Carpenter, T. S. Hudson, B12 Board of Trade. Heating and plumbing, J. A. Gordon, 301 St. Antoine. Three storeys, 75 x30.

Addition to school, cost $17,000, Drolet street for School Commissioners, St. J. Baptiste, Montreal. Architect, J. A. Godin, 269 St. Denis St. General contractor and mason, P. J. Charlebois, 1234 St. Hubert. Heating and plumbing, J. & C. Brunet & Co., 223 St. Lawrence. General contractor will receive tenders for other trades. Four storeys, 30 x 30, stone and brick construction.

Catholic Y. M. C. A., cost $20,000, St. Dominique, near Mile End Station, for Rev. Emile Piche, cor. Bernard and Waverly. Architects, Gauthier & Daoust, 180 St. James St. General contractor, T Lessard, 210 Park Ave. Three storeys, 40 x 65, cement foundation, brick construction.

Church, cost $25,000, Huntley, for Amherst Park Congregational Church, c/o H. Moule, 1949b Christopher Columbus. Architect, J. Seath Smith, 779 Sherbrooke W. General contractors, Raymond Construction Co., 46 Alexander.

Welland, Ont.
Church, cost $6,500, Devon, for R. C. Corporation (Father Berardo). General contractor, W. J. Hickey, 91-93 Main St. E. One storey, 42 x 100, frame construction.

Windsor, Ont.
Alterations to police station, cost $1,498.50, for City Council. Mayor, Henry Clay. Architects, G. Jacques & Company. General contractors, Cadwell Sand & Gravel Co.

Winnipeg, Man.
Church, Qu'Appelle St., for Knox Presbyterian Church. Pastor, Rev. Dr. F. P. DuVal. Architect, J. H. G. Russell, 1110 McArthur Bldg. General contractors, J. McDiarmid Co., Ltd., Canada Bldg.

Business Buildings and Industial Plants

Brampton, Ont.
Factory, for J. W. Hewetson Co., Ltd., shoe manufacturers, 88 Terauley St., Toronto. Three storeys, 115 x 250. Town granted loan of $20,000.

Plant for Hough Litho Co., 96 Sapdina Ave., Toronto. Town granted loan of $15,000. Building will be remodeled, Hydro power to be used.

London, Ont.
Cattle sheds, cost $7,500, for Western Fair Board. President, W. J. Reid. Sec., A. M. Hunt. One storey, reinforced concrete and frame construction. Plans in progress.

Montreal, Que.
Garage and office building for Automobile Club of Canada. President, Howard Pillow. Sec., Geo. A. McNamee, 10 Cathcart St., Montreal.

Two stores and residence, cost $6,000, Sherbrooke W., for A. D. Quintin, 760 Ontario E. Architect, I. Denis, corner Carriere and Delorimier Sts. Three storeys, 25 x 65, cement foundation, brick construction. Plans prepared.

Market, cost $100,000, Maisonneuve (Ontario St.), for City Council. Sec., Mr. Ecrement. Tenders will be called shortly by Architect, M. Dufresne, Lasalle and Ontario, Bank of Toronto, for all trades except stone and steel work.

Business building, cost $150,000, for J. B. Baillargeon Express Co., 329 Ontario street east. Architect not chosen. Bldg. will not be started until spring, 1914. Four storeys.

Hotel alterations for C. P. R., Montreal. Architect, Mr. Videtto, C. P. R., Windsor Station, Montreal. Extensive alterations to interior of Place Viger Hotel, east wing.

Walpole Rubber Co., 8 McGill College ave., contemplated building a rubber factory.

Ottawa, Ont.
Addition to store, cost $6,000, Lewis, for Matthew-Lang Co. Architect, W. E. Noffke, Central Chambers. Solid brick construction. Plans ready.

Paris, Ont.
Opera house, Mechanic, for Syndicate. Representative, A. Campbell. Further information from Thos. McCosh, Paris. 126 x 62, white brick construction.

Preston, Ont.
Preston Chair Co. contemplate building a factory. By-law passed granting loan.

Quebec, Que.
Clothing factory, cost $5,000, St. Dominique, for St. Lawrence Clothing Co., 17 St. Dominique street. Architects, Talbot & Dionne, St. Joseph street. Three storeys, 25 x 54, stone foundation, red brick and structural steel construction. Plans in progress.

St. John, N.B.
Alterations to store and flats, Main, for Percy Steel, 519 Main St. Architect, Garnet Wilson, 50 Princess St. Wood construction. Plans ready.

St. Thomas, Ont.
Factory for L. E. Ewing, Findlay, Ohio, U.S.A.. Two storeys, 60 x 200, brick construction. Will manufacture motor trucks. Further information from W. K. Cameron, Barrister, St. Thomas.

Sarnia, Ont.
Garage for Hitchcock & Richardson. One storey, white brick construction. Plans under way.

Toronto, Ont.
Four stores and residences, cost $30,000, Queen and Kippendavie, for Stennet Bros., 1925 Queen E. Mason, Booth Bros., 51 Kingswood Rd. Carpenter, Can. Constr. Co., 311 Sherbourne St. Tenders received by Architect, W. H. Mallory, Room 25-31 Queen W., until July 19th, for heating. Three storeys, brick construction.

Welland, Ont.
Freight shed. Builders and owners, Interlake Line Ltd. Plans in progress.

Windsor, Ont.
Stores and flats, cost $35,000, for A. St. Dennis, 155 London St. W. Two storeys, 10 x 70, brick and tile construction, cement foundation. Tenders received by architects, Atcheson & Adams, Room 1, Thompson Bldg., till July 28th.

CONTRACTS AWARDED

Brantford, Ont.
Bank building, cor. Market and Darling, for Bank of Montreal. Local manager, A. Montizambert. Architects, Barott, Blackader & Webster, 508 New Birks Bldg., Montreal. General contractors, Messrs. Anglins Ltd., Montreal.

Campbellton, N.B.
Sulphite mill for The St. Lawrence Pulp & Lumber Corporation, Grand Pabos, Que. Interested, Mr. Whitmer, c/o Wm. Whitmer & Sons, Philadelphia. Builder, Owners. 100 ton capacity. 18 miles of railroad being built into mill site.

Cornwall, Ont.
Addition to plant, cost $6,000, for Toronto Paper Mfg. Co., Cornwall. Architect, C. P. Meredith, 126 Sparks street, Ottawa. General contractors, Owner. Reinforced concrete construction. Most of the work to be done by day labor.

Edmonton, Alta.
Store and office, cost $15,000, Spruce, for E. S. McQuaid, Gariepy Block. Architect, P. Marvin, Jackson Block. General contractors, Bishop & Webster, 699 Namayo Ave. Three storeys, 50 x 50, frame construction.

Warehouse, cost $15,000, Bellamy St., for British-American Paint Co., Laurel Point, Victoria, B.C. General contractor, F. Woodyard, 528 Clara St. Two storeys, 30 x 100, brick construction.

Fonthill, Ont.
Store and apartments for J. E. McCombs. General contractor, Harvey

McCombs. Three storeys, 36 x 44, frame construction.

Hamilton, Ont.

Three stores, Barton St., for Globe Realty Co., Ltd., Lister Chambers. Architect, E. B. Patterson, 167½ King St. E. General contractor, W. Inrig, Flatt Ave. Three storeys, brick construction.

Hamilton Inlet, Labrador

Pulp mill for The Labrador Pulp & Paper Co., St. Johns, Newfoundland. Vice-Pres., H. R. Reid, c/o Co. Builder, Owners. To have a yearly capacity of 90,000 tons.

London, Ont.

Remodelling store, cost $10,000, for J. H. Chapman & Co., Dundas st. Architect, McBride & Gilbert, Edge Block, London. General contractor, T. Copp, 31 Beaconsfield Ave., South London.

Medicine Hat, Alta.

Store and Warehouse for Dominion Grocery Co. General contractors, The Lussier Construction Co., Alberta Hotel.

Montreal, Que.

Warehouse and flats, cost $6,000, Clarke. Builder and owner, Medard Paquette, 18 Blvd. St. Joseph W. Three storeys, 42 x 38, stone foundation, brick construction.

Alterations to offices, cost $6,000, St. Sacrament, for Burnett & Co., 12 St. Sacrament. Architects, Hogle & Davis, 80 St. Francois Xavier. General contractor, R. Ryan, rear 697 Atwater. Two storeys, 48 x 20.

Offices, Beaver Hall Hill, for The Guarantee Co. of North America, 57 Beaver Hall Hill. Architect, K. G. Rae, 54a Beaver Hall Hill. General contractors, Geo. A. Fuller Co., Ltd., 210 Reed Bldg. Concrete, F. J. Jago, 10 Victoria street. Millwork, T. Pringle, Belleville, Ont. Roofing, Hickey & Aubut, 93 Dominion. Plastering, McNulty Bros., 182 Mountain St. Heating, plumbing and electric, W. N. Dietrich, Reed Bldg. Terro cotta, B. & S. H. Thompson & Co., Trans. Bldg.

Alterations to store and flats, cost $10,000, 212 Peel, for Samuel Ogulnik, 350 St. Catherine W. Builder and general contractor, L. Beaudry, 2320 Hutchison. Heating and plumbing, Felter Bros., c/o Builder. Electric, not given, call tenders later. Three storeys, 57 x 25.

Factory, cost $6,000, Larin Ave., for Malone Moulding & Framing Co., 48 Beaver Hall Hill. Architects and general contractors, Anglins, Ltd., 65 Victoria St. Other tenders called later. Two storeys, 25 x 75, cement foundation, mill construction.

Store and flats, cost $15,000, Maisonneuve (Adam), for L. Bois, cor. Adam and Aird. Builder, A. Chequette, 170 Bourbonniere. Brick, Prudent Desjardins, c/o Owner. Carpenter, painting and interior fittings, Builder. Roofing, F. X. Guay, 71 St. Germain. Heating and plumbing, Corin Surprenant, c/o Builder. Electric, F. Bouchard, c/o Builder.

Ottawa, Ont.

Stores and apartments, cost $40,000, Bank, for Thos. Clarey, Central street. General contractor, mason and brick, Owner. Other trades not let yet. Solid brick construction.

Stores and apartments, cost $15,000, Rideau. Architect and owner, S. Armour, c/o Royal Realty Co., Bank St. All work being done by day labor, inside fittings for stores will be commenced in a couple of weeks. Three storeys.

Garage and alterations to residence, cost $10,000, Laurier, for F. W. Carling, Metropolitan Bldg. Architect, C. P. Meredith, 126 Sparks St. Carpenter, Taylor & Lackey, 21 1st Ave. Heating and plumbing, Holloway & Sons, 373 Somerset. Painting, plastering and electric not let yet.

Factory, cost $35,000, Nelson, for Crown Lithographing Co., Ltd., 188 Wellington St. Architects, Dore & Coyles, 72 Patterson Ave. General contractors, Toms & Copeland, c/o Architect. Lighting and plumbing, M. M. O'Connell, 212 Gloucester. Two storeys, 175 ft. x 60 ft.

Business block, cost $100,000, Bank, for F. W. Carling, Metropolitan Bldg. Architect, C. P. Meredith, 126 Sparks St. Mason, Alex. Garvock, 136 Lewis. Carpenter, Alex. Christie, Elgin St. Painting, W. J. Carson, 293 Laurier W. Heating and plumbing, M. M. O'Connell, Gloucester St. Electrical, Marchand & Donnelly, 1282 Sparks St. Reinforced concrete construction.

Peterboro, Ont.

Factory, cost $65,000, Park, for Henry Hope & Sons, Ltd., Peterboro. Architects, Sproatt & Rolph, 36 North St., Toronto. General contractors, R. Sheeby, Finnie & Gordon, Peterboro. One sty., 182 x 220, cement foundation, reinforced concrete and solid brick construction.

Regina, Sask.

Industrial building, cost $20,500, Exhibition Grounds, for City of Regina. Manager of grounds, D. T. Elderkin, 201 Donahue Block. Architect, N. R. Darrack, Western Trusts Bldg., 11th Ave. General contractors, Parsons Construction Co., Scarth St. Two storeys, 165 x 180, frame construction.

Warehouse, cost $25,000, Broad, for Scott Fruit Co. General contractor, J. McDiarmid, Winnipeg. One storey, 50 x 100, brick and reinforced concrete construction.

Office building, cost $10,000, 6th Ave. Builder and owner, W. H. Joyce. Brick construction, cement foundation.

Offices, cost $10,000, Hamilton, for Commercial Lunch Co., Commercial Blk. General contractors, McDiarmid & Donnelly, Scarth St. Two storeys, brick and stone construction.

St. John, B.C.

Warehouse, cost $15,000, for M. E. Agar, Commissioner Public Works, City Hall. Work done by day labor. Cement foundation, stock brick construction.

Factory, Marsh Rd., for Oil Motor & Mfg. Co., Ltd. Director, M. L. G. Vincent, 126 Charlotte St. Architect, F. Neil Brodie, 42 Princess St. General contractor, Jas. Myles, 175 Wright St.

St. John, N.B.

Sugar refinery, Ballast Wharf, for Atlantic Sugar Refinery Co., c/o L. A. Wilson, Ballast Wharf. Architect, R. S. Kent, 115 Montague street, Brooklyn, N.Y. Engineer, Henry Holgate, Richelieu Bldg., Montreal. General contractors, Superstructure, Dominion Bridge Co., Ltd., Lachine, Que. Chief engineer, Jas. Finley, c/o company.

Stratford, Ont.

Factory, Douro, for Farquharson-Gifford Co., Douro St. Architect, J. S. Russell, 21 Downie St. Mason, Jno. L. Young, 240 Birmingham St.

Theatre, cost $10,000, Ontario, for William Gordon, Albion Hotel. Architect, J. S. Russell, 21 Downie St. Work done by day labor. One storey, 40 x 116.

Toronto, Ont.

Warehouse, cost $6,500, Bloor W., for F. Greenaway & J. C. Bolton, 1239 Bloor W. Architect, J. Hunt Stanford, Bloor and Ossington. General contractor, R. C. Bustard, Confed. Life Bldg. Two stys., 35 x 85, structural steel and brick construction.

Factory, cost $10,000, River street, for Stewart Hartshorn Co., River street. General contractor, D. A. Peacock, 577 Church street. Dry kiln, Grand Rapids Veneer Works, Grand Rapids, Michigan. One storey, 38 x 82, brick construction.

Windsor, Ont.

Factory, cost $50,000, Factory Dist., for Kelsey Wheel Co., Detroit and Windsor. Builders and general contractors, Wells & Gray, Windsor. One and two storeys, 360 x 60, 50 x 300, boiler, store rooms and dry kilns, reinforced concrete and brick construction. Few sub contracts to be let.

Store, cost $8,000, for Osterhout & Little. Architects, Leybourne & Whitney. Owners will do own work. Two stys., 85 x 26, brick construction.

Winnipeg, Man.

Store for W. J. Russell, c/o architect, Wm. Fingland, Enderton Bldg. General contractors, Fraser & Faulkner, 512 Gertrude ave. One storey and basement, pressed and common brick construction.

Bank, Elmwood, for Bank of Nova Scotia, Winnipeg. Architects, Jordon & Over, Can. Life Bldg. General contractor, Major Schurman, 34 Can. Life Bldg.

Improvements to hotel, cost $20,000, McDermot and Albert, for G. B. Campbell, Mariaggi Hotel. General contractors, H. L. Stephens & Co. Tile and maple floors, plate glass, refrigerators, boilers, oak finish. Fittings will be required for bar, kitchen, etc.

Stores and apartments, cost $35,000, College and Main, for W. B. Chambers, c/o Architect. Architect, Chas. S. Bridgeman, Can. Life Bldg. General contractors, Simmons Bros. Three stys., 34 x 48, brick and cut stone construction.

Residences

Berlin, Ont.

20 residences, cost $4,500 each, for R. J. Haley & Co. Plans in progress.

Dundas, Ont.

Residence, cost $5,000, Alma, for Jas. Doyle. Architects, Stewart & Witton, H. P. & L. Bldg., Hamilton. Two stys., 28 x 32, brick construction. Plans prepared.

Hamilton, Ont.

Addition and alterations to residence, Ravenscliffe, for Sir. Jno. M. Gibson, Government House, Toronto. Tenders received by Architects, Munro & Mead, Chancery Chambers. Three storeys and tower.

Exeter, Ont.

Three residences, cost $7,000, for Thos. Elliott. 1½-storeys, white brick construction. Plans ready.

Forest, Ont.

Apartment, cost $4,000, for Dominion Canners Ltd., Hamilton. Architect, Firm's architect. Two storeys, white brick and frame construction. Plans ready.

London, Ont.

Residence, cost $5,000, William. Architect and owner, W. H. Braddon, 546 King St. Two storeys, stone and cement construction. Plans ready.

Residence, cost $5,200, Sherwood Ave., for John Gunn, 136 Kent St. Architect, John M. Moore, 435½ Richmond street. Two storeys, red pressed brick construction.

Medicine Hat, Alta.

Residence, cost $5,000, for James Fleming, American Hotel. Architect, T. Millican, Portor Block. Two storeys and basement. Plans in progress.

Montreal, Que.

Two cottages, cost $12,000, Notre Dame de Grace Ward. Builder and owner Chas. Fyfe, 137 Park Ave. Only private tenders to be called. Two storeys, 25 x 42, cement foundation, brick construction.

12 flats, cost $10,000, Oxford, for L. P. Forest, 847 St. Joseph Blvd. Builder and carpenter, Owner. Mason, C. G. M. Martin, 212 McGill St. Roofing, J. Lamarche, 195 Blvd. St. Joseph T. Tenders received by Owner for heating, plumbing, painting and electric work. Three stys., 100 x 160, brick construction.

Cottage, cost $10,000, Outremont (Rock-land), for J. R. Rolland, c/o Architect. Concrete and carpenter, J. Deslauriers, c/o Architect. Other tenders received by Architect, J. A. Karch, 187 St. Denis St.

Three residences, cost $20,000, Outremont (Bloomfield), for A. Corbin, 1149 Van Horne. Architects, Viau & Venne, 76 St. Gabriel, Montreal. Three stys., 20 x 77, stone foundation, pressed brick construction. Mr. Lavalee is looking after work for Mr. Corbin and will receive tenders shortly. Address 1149 Van Horne.

Garage and residence, cost $5,000, Outremont (De Lepee), for Hon. T. Berthiaume, 203 St. Catherine Rd. Architect, J. A. Karch, 187 St. Denis. Concrete and carpenter, P. Brouillet, 79½ St. Elizabeth. Tenders for other trades received by Architect. Two storeys, 25 x 38, cement foundation, pressed brick construction.

Oak Bay, B.C.

Residence, cost $8,000, for Modern Homes Ltd. Architects, Jennings & Boulanger. Two storeys, frame construction. Plans ready.

Ottawa, Ont.

Residences, cost $5,000, Wilbrod, for Wolf Shenkman, 226 Friel St. 40 x 12, 35 x 24, brick veneer construction.

Residence, cost $10,000, Powell, for Mr. Quinn, c/o Architect. Tenders received by Architect, F. C. Sullivan, Castle Bldg., Queen St., until July 19th. Three stys., ornamental stone facing, solid brick construction.

Residences, cost $7,000, Coburg, for Wolf Shenkman, 226 Friel St. Two stys., 60 x 25, 27 x 15, brick veneer construction. Plans under way.

Residence, cost $18,000, Carling, for W. F. Powell, 570 Sussex street. Architect, W. E. Noffke, Central Chambers. 2½ storeys, stucco construction. Plans prepared.

Residence, cost $14,000, Monkland, for E. A. Band, Clarey ave. Architect, W. E. Noffke, Central Chambers. Stone and stucco construction, stone foundation. Plans prepared.

Toronto, Ont.

Residence, cost $5,200, Alexandra Blvd., for E. F. Whittemore, Hampton Mansions. General contractors, mason and carpenter, Forbes & Love, Kingsley Mansions. Painting, Corin & Jennings, 58 Geary Ave. Tenders received by General Contractors until July 24th for roofing, July 25th for plastering, July 13th for heating, July 18th for plumbing and electrical. 2½-storeys, 34 x 24.

Three attached residences, cost $6,000, Delaware, for C. S. West, Bloor St. Architect, J. H. Stanford, Bloor and Ossington. Owner will be ready for tenders about August 10th. Two storeys, 44 x 42, brick construction.

Residence, cost $25,000, Nina and Wells for J. Dinwoody, 28 Bracondale. Architects, Harvey & Haffa, Bay St. Mason, F. & A. E. Ham, 83 Salem Ave. Architect now open for other trades.

Three attached residences, cost $6,000, Bartlett. Builder and owner, L. E. Price, 870 Dovercourt Rd. Owner will let heating, plumbing, wiring and plastering. 2½ storeys, 48 x 42, brick construction.

Three attached residences, cost $6,000, Dufferin, for Greater Canada Improvement Co., 912 Bloor W. Architect, W. G. Hunt, 935 Bloor W. Owners employ regular staff. Will let heating, plumbing and wiring shortly. 2½-storeys, 46 x 44, brick construction.

Three attached residences, cost $9,000, Delaware. Builder and owner, C. Lurie, 82 Markham St. Owner now open for tenders. 2½-storeys, 48 x 44, brick construction.

Three attached residences, cost $6,000, St. David St., for H. Fine, 12 Milan St. Architect, R. A. Abraham, 23 Jordan. Two storeys, 48 x 44, brick construction. Plans prepared.

Three attached residences, cost $6,000, Nairn ave., for W. Pidgeon, 41 Nairn ave. Architect, J. H. Mason, 23 Westmoreland. 2½ storeys, 48 x 41, brick construction. Plans ready.

Two pair residences, cost $8,000, Wineva, for Cox & Cummings, 36 Canada Life Bldg. Owners do work with own staff. Will sublet heating, plumbing and wiring. Two storeys, 33 x 42; brick construction.

One detached residence, cost $5,000, Laburnam, for Mrs. M. A. Ford, 96 Dunn ave. Architect, J. A. Thatcher, 31 Queen St. W. Tenders now open, received by owner. 2½ storeys, 23 x 44, brick construction.

Vancouver, B.C.

Apartment, cost $153,000, Hastings and Jackson Sts., for Morden Thornton, c/o Architects. Architects, Braunton & Leibert, Exchange Bldg. Six storeys, brick and mill construction. Plans prepared.

Waterloo, Ont.

Bungalow, cost $7,000, for Ezra W. Schmitt, John and Mary Sts. Architect, Ornan G. Scheifle. 32 x 30, cobble stone foundation, tapestry brick and white stucco panelled construction.

Winnipeg, Man.

Two residences, cost $11,000 each, Wellington. Builders and owners, Simmons Bros., 290 Portage Ave. Plans in progress.

Residence, St. Vital, for Prov. Govt., Dept. of Public Works, Winnipeg. Architect, Provincial Architect, 261 Fort St., Winnipeg. Plans, specifications, etc., at office of architect. Tenders received for construction of a Principal's residence by Acting Minister G. R. Coldwell, Winnipeg, till July 22, 1913.

CONTRACTS AWARDED

Amherst, N.S.

Two residences, cost $6,000, Robie, for W. J. McNair. Architect, J. L. Allen. General contractor, Jos. Baxter. Two storeys, 23 x 33, "L" 12 x 15 each, cement foundation, frame construction.

Dunnville, Ont.

Residence, cost $5,000, for T. J. McCutcheon, Dunnville. Builder and general contractor, Geo. W. Hall, Brantford. Two storeys, 30 x 50, pressed brick construction.

Hamilton, Ont.

Residence, cost $15,000, Inglewood. General contractor and owner, W. A. Noble, 80 George St.

Residence, cost $25,000, Queen St., for J. W. Lamoreaux, 26 Canada St. Architects, Munro & Mead, Chancery Chambers. General contractor, W. H. Yeates, Jr., 24 Leeming street.

Four residences, cost $9,500, Balsam Ave. General contractor and owner, J. H. Sommerville, 28 Prospect Ave. Brick construction, concrete foundation.

Four residences, cost $12,000, Spadina ave. General contractor, H. Dunham, 719 Cannon St. E. One pair, walls up, 1 pair, roofing.

Montreal, Que.

Eight flats, cost $6,000, City Hall. Builder and owner, G. Osterman, 3004 City Hall. Two storeys, 25 x 43, cement foundation, brick construction.

Residence, cost $7,000, Lachine (10th Ave.), for A. N. Carriere, Strathmore. Architect, Dalbe Viau, 76 St. Gabriel St., Montreal. Owner doing all work.

Flats, cost $6,000, City Hall. Builder and owner, Moses Waxman, 540a Sanguinet. Three storeys, 36 x 65, concrete foundation, brick construction.

Four flats, cost $6,000, Regent. General contractor and owner, Jas. L. Rankin, 177 Mansfield. Owner doing all work. Two storeys, 50 x 69, concrete foundation, brick construction.

Ten residences, cost $33,000, Emard Ward. Builders and owners, J. A. Davis & Co., Ltd., Dom. Express Bldg. Cement foundation, brick and stucco construction.

Flats, cost $7,000, St. Zotique, for D. D. Gauthier, 111 St. Zotique. Architect, R. Charbonneau, 15 St. James St. Brick, J. Casavant, c/o Owner. Carpenter, A. Seguin, 1773 St. Lawrence. Other contracts not awarded.

Garage and alterations to residence, cost $20,000, Peel St., for Duncan McIntyre, 366 Peel St. Architect, H. C. Stone,

(Continued on page 70)

Tenders and For Sale Department

TENDERS

Tenders will be received up to the **19th of July** for the erection of two rooms to the present Primary Central School, Brampton.

Plans and specifications can be seen at the Secretary's office on and after the 10th of July.

Tenders will be received for all the work or any part or parts thereof.

The lowest or any tender not necessarily accepted.

T. J. BLAIN,
Secy. Brampton Public School Board,
Dated July 8, 1913. Brampton, Ont.
29

Building Contract Tender

Tenders will be received by the undersigned for the work and materials for an addition to the House of Refuge at Whitby to be completed on or before the first day of November, 1913.

For particulars as to work to be done apply to

Dr. LAVERY,
Superintendent of the House of Refuge,
Whitby, Ont.
or J. E. FAREWELL,
County Clerk and Solicitor,
Whitby, Ont.

Tenders will be received up to the 2nd day of August, 1913, and must be accompanied by a marked cheque for $150. 29

Sealed tenders addressed to the undersigned and endorsed "Tender for Toronto Harbour Works," will be received at this office until 4 p.m. on **Monday, August 25, 1913**, for the construction of a Sea Wall, Breakwater, Ship Channel and Retaining Walls at the City of Toronto, **in the County of York, Province of Ontario.**

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department and at the offices of the District Engineer, Confederation Life Building, Toronto, Ont.; **Harbour Commissioner's Office, 76 Adelaide St.** West, Toronto; H. J. Lamb, Esq., District Engineer, Windsor, Ont., and J. L. Michaud, Esq., District Engineer, Post Office, Montreal, Que.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to five per cent. (5 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, July 12, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—44297. 29-30

Tenders for Debentures

Municipality of McIrvine

Sealed tenders addressed to the undersigned will be received for the sale of thirteen $1,000 twenty-year Sinking Fund School Debentures bearing interest at 6 per cent.

FRANK J. STRAIN, Clerk.
29-30 Fort Frances, Ont.

Notice to Contractors

Sealed proposals will be received at the offices of the Water Commissioner, City Hall, until 12 noon, **July 31st, 1913**, for the fabrication and laying of about 10¼ miles of 36-in. rivetted steel pipe and appurtenances on the line of the Sooke Water Supply pressure conduit, and in accordance with the requirements of the general specifications prepared by Wynn Meredith, Consulting Engineer for such construction, pursuant to the provisions of By-law No. 814.

Plans and specifications can be seen, and forms of tender obtained at the Sooke Water Supply Office, 1414 Douglas Street, Victoria, B.C.

The lowest or any tender not necessarily accepted.

C. H. RUST,
Water Commissioner.
Victoria, B.C.,
June 27th, 1913. 28-29-30

Sealed tenders, addressed to the undersigned, and endorsed "Tender for Wharf at Vancouver, B.C.," will be received at this office until 4 p.m., on **Thursday, August 21, 1913**, for the construction of a Wharf at Vancouver, B.C.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department and at the offices of C. C. Worsfold, Esq., District Engineer, New Westminster, B.C.; J. S. MacLachlan, Esq., District Engineer, Victoria, B.C., The District Engineer's Office, Confederation Life Building, Toronto, Ont.; J. L. Michaud, Esq., District Engineer, Post Office Building, Montreal, Que., and on application to the Postmaster at Vancouver, B.C.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and places of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to five per cent. (5 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, July 8, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department. 44661.
29-30

Tenders Wanted

Sealed tenders, addressed to the undersigned, marked "Tenders for Automatic Street Flushing Machine," will be received up till 4 o'clock in the afternoon of the **29th day of July, 1913**, for supplying an Automatic Street Flushing Machine of at least 600 gals. capacity.

Tenderers must supply their own specifications and designs.

A marked cheque for $200 must accompany each tender, made payable to the order of the City Treasurer, which cheque will be subject to forfeiture in case of failure on the part of the successful tenderer to enter into a written agreement and bond with the City of Windsor with approved sureties when called upon to do so.

The lowest or any tender not necessarily accepted.

M. E. BRIAN.
City Engineer.
28-29

PRICEVILLE, ONT.

Tenders for Steel Bridge and Abutments

Sealed tenders marked "Tender," addressed to the Reeve, Township of Glenelg, Priceville, will be received up to **August 1st** for the construction of a bridge at Traverston, near Markdale.

Tenders will be received as follows:—

1. Two concrete abutments.
2. Reinforced concrete floor, 110 x 14 ft.
3. Steel bridge, 110 ft. span, 14 ft. wide.

An accepted bank cheque for 5 per cent. of contract, payable to the Treasurer of Twp. of Glenelg, shall accompany each tender and will be returned on non-acceptance.

Plans and specifications may be seen at the offices of the Reeve or Engineer.

The lowest or any tender not necessarily accepted.

THOS. NICHOL, Reeve.
Priceville, P.O.
R. McDOWELL, Engineer,
29-30 Owen Sound, Ont.
Priceville, July 14, 1913.

TOWN OF BASSANO, ALBERTA

Sewage Disposal Works

Sealed tenders, addressed to the undersigned, will be received up till 18 o'clock on **Friday, 15th August, 1913**, for all labor and materials (except filter distributors) necessary for the construction of sewage disposal works, consisting of tank and filter and relative works near the Town of Bassano.

Tenders must be accompanied by an accepted cheque for five per cent. of the amount of the **tender, or alternatively by the bond of an approved** guarantee company.

Plans and specifications and other information may be obtained at the offices of the Consulting Engineers at Winnipeg and Calgary, on deposit **of $25, which will be returned to bona fide** tenderers on return of the plans.

The Corporation do not bind themselves to accept the lowest or any tender.

GEO. B. R. BOND, Sec.-Treasurer,
July, 1913. Bassano, Alta.

The John Galt Engineering Co., Ltd.,
Consulting Engineers. 29-30

Tenders for Bridge

Tenders will be received up to noon, **July 24th, 1913**, for the erection of a steel bridge 90 ft. c. to c. I. W. on lot 20 x 21, Con. III. S. P. R. Bentinck. Also for two concrete abutments for same. Plans and specifications may be seen with Henry Metcalf, Hanover, or James Warren, Engineer, Walkerton. A certified cheque for $200 to accompany each tender.

Signed, ALEX. WILSON,
Elmwood, Ont.
Bentinck, July 7, 1913. 28-29

Tenders Wanted

Sealed tenders, addressed to the undersigned, marked "Tenders for Incinerator," will be received up till 4 o'clock in the afternoon of the **29th day of July, 1913**, for supplying all labor, tools, and machinery for the construction of an Incinerator of a capacity to dispose of at least 25 tons per day of garbage and refuse. Incinerator must also be capable of destroying all kinds of refuse, including night soil and dead animals.

Contractors must supply their own specifications and designs, including brick or reinforced concrete building.

A marked cheque for 10 per cent. of amount of tender must accompany each tender, made payable to the order of the City Treasurer, which cheque will be subject to forfeiture in case of failure on the part of the successful tenderer to enter into a written agreement and bond with the City of Windsor with approved sureties when called upon to do so.

Incinerator must be guaranteed for at least one year from date of operation.

The lowest or any tender not necessarily accepted.

M. E. BRIAN,
City Engineer..

Notice to Contractors

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on **Tuesday, July 22nd, 1913**, for the construction of the following sewers:—

Leslie St., Danforth Ave. to North City Limits.
Hastings Ave., Gerrard Street to Doel Avenue.
Fielding Avenue, Leslie Street to Jones Avenue.
Furniss Avenue, Leslie Street to Jones Avenue.
Fifth Avenue, Leslie Street to Jones Avenue.
Skipper Avenue, Leslie Street to Jones Avenue.
Butternut Street, Jackman Ave. to Ellerbeck Ave.
Chatham Ave., Greenwoods Ave. to 554 ft. West.
Lark Street, Queen Street to Kingston Road.
Lockwood Avenue, Queen Street to Dixon Ave.
Pendrith St., 300 ft. E. of Shaw St. to 327 ft. E.
Lane 1st S. Bloor St., Shaw St. to Roxton Rd.
Lane 1st N. Queen St., Triller Ave. to Callender.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications may be seen and forms of tender obtained at the office of the Commissioner of Works, Toronto.

Tenderers shall submit with their tender the names of two sureties, or in lieu of said sureties, the Bond of a Guarantee Company approved of by the City Treasurer.

The usual conditions relating to tendering as prescribed by City By-law must be strictly complied with.

The lowest or any tender not necessarily accepted.

H. C. HOCKEN, Mayor,
Chairman, Board of Control.
Toronto, July 8th, 1913. 29

PETROLIA, ONT.

Tenders for Concrete Trunk Sewer

Tenders will be received by the undersigned up to 5 p.m. on **Monday, the 28th day of July, 1913**, for the re-construction with cement concrete work of about 1,000 lineal feet of outlet to Trunk Sewer in the Town of Petrolia.

Plans and specifications may be seen at the Town Clerk's office.

The lowest or any tender not necessarily accepted.

29-30 J. McHATTIE, Town Clerk.

Special Notice

Every man who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works are advertised.

Send along your plans when asking for tenders put a line in your advertisement to that effect.

No extra charge is made for filing plans at one or all four offices.

Contract Record and Engineering Review

Montreal—119 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—429 Pender Street.

Notice to Contractors

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on

Tuesday, July 29th, 1913

for the supply of

Portable Sewage Pumping Engines

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications may be seen and forms of tender obtained at the office of the Commissioner of Works, Toronto.

The tenderers shall submit with their tender the names of two sureties or in lieu of said sureties, the bond of a guarantee company approved of by the City Treasurer.

The usual conditions relating to tendering as prescribed by City By-law must be strictly complied with.

The lowest or any tender not necessarily accepted.

H. C. HOCKEN, Mayor,
Chairman, Board of Control.
Toronto, July 7th, 1913. 29

Tenders For Bridge

Tenders will be received for the erection of a steel bridge 45 ft. c. to c., 14 ft. roadway, at Lot 26 Town Line Arron and Elderslie. Tenders received up till noon 22nd July, and opened at the site at 3 p.m. A cheque for $100 to accompany each tender. The lowest or any tender not necessarily accepted. Plans may be seen with James Warren, Engineer, at Walkerton, or the undersigned.

Signed, S. K. EUART.
Chesley, July 7th, 1913. 28-29

For Sale

One Koehring Concrete Paving Mixer, capacity 14 cu. ft.

One Austin Cube Concrete Paving Mixer, capacity 9 cu. ft.

One 20 h.p. Case Traction Engine.

All of above used only a few months and in perfect condition.

Apply Box 831, Contract Record, Toronto, Ont.
29-t.f.

Tenders for Dredging

Sealed tenders will be received at the Clerk's office, Chatham, Ont. (where plans and specifications can be seen) up to 12 o'clock noon, on **Thursday, July 31st, 1913**, for dredging about 9 miles of drainage work in the Township of Dover, County of Kent. The work to be let subject to the final passing of the By-law.

The lowest or any tender not necessarily accepted. Tenders must be marked "Tenders for Dredging," and each accompanied with a marked guarantee cheque for $2,000.

Dated, June 17th, 1913.

H. M. BEEHARD, Reeve.
JOHN WELSH, Clerk,
26-30 Chatham P. O.

Town of Carlyle, Saskatchewan

Waterworks and Electric Lighting

Sealed tenders, addressed to the undersigned, will be received up till 18 o'clock on **Friday, 1st August, 1913**, for the following contracts:—

1. Construction of brick power house and concrete reservoir, and laying approximately 800 lineal feet of pipe in trenches, and relative works.
2. Supply of Air-Lift Pumping System.
3. Supply of Duplex Steam Pump.
4. Supply and erection of two H. R. T. Boilers and Stack.
5. Supply and erection of compound vertical steam engine.
6. Supply and erection of Generator, Exciter and Switchboard.
7. Supply of Poles, arms, hardware, copper wire, transformers and meters.
8. Supply of Series Tungsten street lighting apparatus.
9. Erection of Pole Line.

Tenders must be accompanied by an accepted cheque for five per cent. of the amount of the tender, or alternatively by the bond of an approved guarantee company.

Plans and specifications and other information may be obtained at the office of the Consulting Engineers at Winnipeg and Calgary. A deposit of $25.00 will be required on Contract No. 1, which will be returned to bona fide tenderers on return of the plans.

The Corporation do not bind themselves to accept the lowest or any tender.

F. J. STENT,
Secretary-Treasurer,
Carlyle, Sask.
The John Galt Engineering Co., Ltd.,
Consulting Engineers. 28-29
28-29

CITY OF LONDON, ONTARIO

Sealed proposals addressed to the Chairman and Members of No. 2 Committee, will be received at the office of the City Clerk until 5 p.m. on **Thursday, July 31st, 1913,** for the construction of the necessary substructure for the proposed highway bridge over the River Thames at Wharncliffe Road, the substructure is comprised of two plain concrete piers, and two reinforced concrete winged abutments. containing approximately 620 cu. yards of concrete, and 17,000 lbs. of steel reinforcement.

Plans, specifications and form of tender may be seen at and obtained from the office of the City Engineer.

Contractors must enclose a marked cheque for five (5 p.c.) per cent. of the amount of their tender.

The lowest or any tender not necessarily accepted.

B. W. BENNETT,
Chairman No. 2 Committee.

WM. N. ASHPLANT,
29 City Engineer.

Pump For Sale

A Blake compound duplex, 10 x 16 x 16 x 18, 12-inch suction and 12-inch discharge, good condition, suitable for town or village supply, cost about $2,000. We offer, if taken at once, for $700. Mills Machine Co., Lawrence, Mass., U. S. A. 29

NOTICE

Extension of Time

On page 73 of this issue there appears a tender advertisement for steel bridge on lot 20 x 21 Con. III. S.P.R. Bentinck. The time for the closing of these tenders has been changed to noon, **Monday, August 11th.**

Signed, ALEX. WILSON,
Elmwood, Ont.
Bentinck, July 15, 1913. 29

BARGAINS!

1 Thew Steam Shovel, used less than 90 days, shop number 690; like new	$3,300
30 1½-yd. dump cars, 36-in. gauge; practically new. Each	30
1 American Well Air Compressor, 12 x 12 x 14, 340 ft. capacity, new	440
1 Rand Belted Air Compressor, 10 x 14; A.1.	240
1 Buckeye Trenching Machine, steam driven; cuts trench 27-in .wide to 8 ft. deep. Overhauled and A.1.	2,500
2 American, 6¼ x 10, D.C., D.D. Hoisting Engines with boilers and boom swingers, A.1. Each	725
1 Three-drum Stronsburg 7 x 10 Hoisting Engine with boiler; practically new.	725
1 Gates No. 5 Crusher, 2 arm Spider, rear drive (Rebuilt B.) Exceptionally low price.	

For anything else second-hand, write

WILLIS SHAW MACHINERY CO.

New York Life Building, Chicago, Ill.

Residences

(Continued from page 67)

84 St. Francois Xavier. Mason, J. H. Hutchison, 64 St. Ambroise. Other work being done by day labor under Architect's supervision. Two storeys, 23 x 25, ressidence three storeys, 14 x 30, stone foundation, brick construction.

20 flats, cost $18,000, St. Dominque. Builder and owner, Denis Magnan, 2816 St. Dominique. Mason, E. Meloche, 304 Eighth Ave., Rosemount. Roofing, electric, heating and plumbing, Napoleon Turcot, 1556 St. Lawrence. Carpenter and painting done by day labor. Plastering, A. Chalifoux, Casgrain St. Three storeys, 125 x 20, felt and gravel roofing. Mr. Magnan contemplates more flats for the fall.

Flats, cost $25,000, St. Lawrence, for Gilbert Demers, 1215 St. Denis St. Brick and carpenter not yet awarded. Roofing, heating, plumbing and electric, Roch Ouimet, 128 Bleury.

Residences, cost $36,000, Outremont, Champagneur, for H. Plante & Co., 1807 Chateaubriand. Builder and architect, general contractor and carpenter, Owner. Brick, A .Bourassa, c/o Owner. Painting, Geo. Fanson, c/o Owner. Plumbing, H. Lemieux, c/o Owner. Electric, Gauthier Gagnon, c/o Owner. Plastering, O. Renaud, 414 St. Hubert.

Flats, cost $12,000, Belgrave, for A. Desjardins, 140 Villeneuve E. Architect and builder, Owner. Brick, A. O'Leary, c/o Owner. Mason, A. Choquette, Grand Blvd. Roofing, heating, plumbing and electric, J. F. Lemieux, 2337 St. Lawrence. Painting Alderic Tasse, 6 Cazelais St. Two storeys, 60 x 52.

Flats, cost $7,000, Clarke, for Medard Paquette, 18 Blvd. St, Joseph W. Architect and builder, owner. Building to start about October. Other flats on St. Lawrence to be built in the spring. Stone foundation, brick construction.

Ottawa, Ont.

Residence, cost $12,000, Marlboro, for Lt.-Col. F. Gourdeau, 27 Golbourn. Architect, C. P. Meredith, 126 Sparks St. Carpenter, Richards & Co.

Residence, cost $7,000, 1st Ave., for J. G. Davidson, 273 1st Ave. General contractor, J. G. Howe, 324 Mutchmore. Brick construction.

Residence, cost $5,000, Fentiman. General contractor and owner, B. A. Grison, 100 Fentiman ave. 2½-storeys, 30 x 34, artificial stone construction.

Residence, cost $9,000, Allan, for E. C. Powell, 341c Kenniston Apts. Architect, W. E. Noffke, Central Chambers. All contracts being done by day labor under supervision of owner.

Quebec, Que.

Residence, cost $5,500, for Ulric Dube, 5th Ave., Limoilou. Architect and general contractor, J. Savard, Limoilou. Three storeys, 36 x 36, concrete foundation, red brick construction.

Two residences, $12,000. Owner, N. Cauchon, Turnbull St. Builder and general contractor, Owner. Three storeys, stone foundation, reinforced concrete and structural steel construction, felt and gravel roofing, gas and electric lighting, hot water heating, fire escapes and extinguishers, ventilating system, concrete and maple floors.

11 residences, cost $120,000. Owner, Hon. S. N. Parent, Ottawa, or 280 Grande Allee, Que. Architects, Tanguay & Lebon, d'Aiguillon St., Que. General contractor, mason and carpenter, Jos. Gosselin, Levis. Architects have been changed.

Residence, cost $8,000, for Isidore Trudel, 369 St. Joseph St. General contractor, masonry and carpentry, M. Paradis, St. Joseph street. Three storeys, stone foundation, artificial stone and structural steel construction. Other contracts not let.

Regina, Sask.

Residence, cost $5,000, Rae St. Builders and Owners, Constructors Ltd., 1602 12th Ave. Two storeys, frame construction.

Residence, cost $5,000, Rae St. Builder and owner, P. D. Steuart, 1934 Retallach St. Two storeys, brick construction.

Residence, cost $5,500, Ottawa St. Builder and owner, R. M. Jaques. Two storeys, brick and frame construction.

Residence, cost $5,000, Cameron. Builders and owners M. Kay Construction Co., 1818 Scarth St. Two storeys, brick construction.

Residence, cost $9,000, Smith St. Builder and owner, T. Bernard. Two storeys, brick construction, cement foundation.

Residence, cost $5,000, Victoria. Builder and owner Beech Bros. Two storeys, frame and brick construction.

Terrace, cost $56,000, 18th Ave., for C. G. Henderson, Darke Block, 11th Ave. General contractors, McDiarmid & Donelly, Scarth St. 2½-storeys, 30 x 128, brick and frame construction.

St. Thomas, Ont.

Two residences, cost $7,000. Builder and owner, Samuel Axford, Elgin street. 1½-storeys, red pressed brick construction.

Toronto, Ont.

Residence, Wilcox, for Harry Rottenburg, Anderson and University. Tenders received now by Architect, I Feldman, 199 Yonge St., for all trades. 2½-storeys, brick construction.

Four pair residences, cost $16,000, Hazelwood Ave. Builders and owners, Muir & Lumb, 857 Carlaw Ave. Two storeys, 33 x 42, brick construction and foundation.

One pair residences, cost $7,000, Enderley. Builder and owner, W. H. Clay, 2172 Gerrard E. 2½-storeys, 40 x 56, brick construction.

Two pair residences, cost $8,400, Hastings. Builders and owners, Hudson Bros., 202 Jarvis St. Two storeys, 34 x 40, brick construction.

Two pair residences, cost $8,000, Fernwood Park. Builder and owner, Geo. A. MacKay, 44 Elmer Ave. Two storeys, 33 x 42, brick construction.

Two pair residences, cost $8,000, Sherwood. Builder and owner, S. C. Hurlburt, 74 St. Clements. 2½ storeys, 34 x 40, brick construction.

Vancouver, B.C.

Residence, cost $14,975, Shaughnessy, for Dr. W. J. Lea, Crown Bldg. Architect, J. G. McKenzie, 330 Homer St. General contractor, M. Arveson, 304 Carter Cotton Bldg. Two storeys and basement, 41 x 56, hot water heating, gas and electric lighting.

Winnipeg, Man.

Residences, cost $10,000, Bertourney St., for R. R. Dobell, 52 Smith St. Architect, C. W. U. Chivers, 52 Keewaden Bldg. 2½-storeys, 24 x 34, stone foundation, brick veneer construction. Work being done by day labor under supervision of Architect.

Apartment, cost $40,000, Evanson St., for R. C. Samwell, Builders' Exchange. Architect and builder, Owner. Three storeys, 31 x 76, stone foundation, brick construction. Owner doing work by day labor.

Residence, cost $5,000, Alice, for Dr. A. G. Snell, Essex. Architects, G. Jacques & Co., Windsor. Work done by day labor. Two storeys, 25 x 37.

Windsor, Ont.
Residence, cost $8,000, Louis, for G. Adams. Architects, G. Jacques & Co. Carpenter and interior fittings, Elmer Gignac. Painting, Wm. Laesser. Heating and plumbing, Pennington & Brian. Electrical, Gilbert Campeau. Lath and plastering, John Reid.

Power Plants, Electricity and Telephones

Ayr, Ont.
Hydro-electric system for Village Council. Clerk, A. J. Reid. By-law to be voted on July 21st.

Bright, Ont.
Hydro-electric system for Village Council. By-law will be voted on July 21st. Address clerk for further information.

Carlyle, Sask.
Power house and reservoir for City Council. Sec.-treas., F. J. Stent. Con. Engineers, The John Galt Engineering Co., Ltd., 314 Kennedy Bldg., Winnipeg. and 233 Judge Travis Block, Calgary. Plans, etc., at office of con. engineers. Tenders received by con. engineers till 18 o'clock August 1st for power house and reservoir, pipes, pumping system, steam pump, 2 boilers and stack, vertical steam engine, generator exciter and switchboard, poles, copper wire, meters, transformers, tungsten street lighting apparatus and pole line.

Drumbo, Ont.
Hydro-electric system for Village Council. Clerk, J. S. Cowan. By-law will be voted on July 21st.

Montreal, Que.
Underground conduits, cost $12,671, for City of Westmount. Engineer, Mr. Jarman. General contractors, R. T. Smith & Co., 175 Metcalf ave.

Oldcastle, Ont.
Lighting system for church for St. Stephen's Congregation. Architects, Leybourne & Whitney, Windsor. Architects wish information and prices for lighting system for church.

Ottawa, Ont.
Exchange, cost $45,000, 1st ave., for Bell Telephone Co., Queen street. Architect, J. Albert Ewart, 193 Sparks St. General contractor, Geo. Crain, Clemow ave. Carpentry, J. & C. Low, 262 Catherine. Iron and steel, Dominion Bridge Co., Sparke street.

Plattsville, Ont.
Hydro - electric system for Village Council. Address Clerk for further information. By-law to be voted on July 12th.

Toronto, Ont.
Car barn for Board of Control. Mayor, H. C. Hocken, City Hall. Site selected, Benson and Bracondale. Plans in progress.

Steam reserve plant, cost $1,000,000 contemplated for Toronto Hydro-electric system, 226 Yonge street. Site not decided.

Winnipeg, Man.
Electrical supplies for School Board, Sec.-treas., R. H. Smith, Alexandria School. Commissioner of School Buildings, J. B. Mitchell, William & Ellen Sts. Tenders called for electrical supplies required for Kelvin and St. Johns Technical Schools.

CONTRACTS AWARDED

Amherst, N.S.
Extension to transformer station, cost $5,000, South Park street, for Maritime Coal, Railway and Power Company. Engineer and architect, J. L. Allen. General contractors, Rhodes, Curry & Co. One storey, 36 x 40, 22 ft. high, cement foundation, red stock brick construction.

Elmira, Ont.
Hydro-electric system, cost $10,000, for Town Council. Clerk, J. H. Ruppel. Engineer, Mr. Surtee. Poles nearly all up from Waterloo to Elmira, also nearly all up around town. Power station almost completed, ready for installation of machinery.

London, Ont.
Addition to power house, cost $20,000, for Ontario Hydro-electric Power Commission, Bay and Richmond streets, Toronto. Chairman, Hon. Adam Beck, London. General contractors, Hyatt Bros., Egerton street, London. Special brick construction.

Miscellaneous

Berlin, Ont.
Fire Hall for City Council (Fire and Light Com.). Clerk, A. H. Miller, General contractor, J. Baetz, Sr., Mill St. Heating and plumbing, Hollinger and Durst, Frederick street.

Goderich, Ont.
Fire alarm system, cost $1,700, for Town Council. Clerk, L. L. Knox. Chairman Com., Mr. Vanatter.

Hull, Que.
Ladder truck, cost $6,000, No. 3 station, for City of Hull Fire Dept. Mayor, Mr. Dupuis. Fire Chief, Tessier. By-law passed.

Milverton, Ont.
Fire equipment for Town Council. Fire Chief Hartmeir. Clerk, W. D. Weir.

Montreal, Que.
Town council of Greenfield Park wish to purchase 20,000 ft. lumber to complete sidewalks. Sec.-treas., F. W. Humphrey.

Lumber for J. B. Brosseau, 240 Papineau ave. (any length 3-in. spruce) .Laurentian Lumber Co., 507 Board of Trade Bldg. (require lumber, spruce and pine especially) H. Bourgoin, Dominion Express Bldg. (all kinds of pine). Fred Smith, 310 Board of Trade (spruce and pine of all kinds). Abel, Fortin & Co., Desjardins ave., Maisonneuve (any size spruce, pine, hemlock and basswood).

Sprinklers and sweepers for Board of Commissioners. Secretary, L. N. Senecal. Council will be asked to pass item of $13,500 for purchase of three motor-driven sweepers manufactured by Durey-Sohys, Paris. Also $6,820 for purchase of a vacuum cleaner from Mussens Ltd., 318 St. James street.

Tilbury, Ont.
Natural Gas Equipment for Union Natural Gas Co. (J. W. Kerr, Chatham, Ont.). Further information from owners.

Windsor, Ont.
Incinerator for City Council. Mayor, Henry Clay. Tenders received by Engineer, J. E. Brian, until 4 p.m. July 29th.

Street flusher for City Council. Mayor, Henry Clay. Tenders received by Engineer, M. E. Brian, until 4 p.m., July 29, for automatic street flusher. Tenderers to supply own specification and plans.

Woodstock, Ont.
Gas mains. Promoters, Geo. H. Orme, Jno. F. Carmady, Brantford; W. R. Tudhope, 165 Yonge street, Toronto. Town Clerk, John Morrison. By-law to be voted on.

Business Notes

Montreal, Que.
St. Charles R. C. Church, 401 Centre street, destroyed by fire. Loss $200,000. Rev. A. Lacasse, Parish Priest, 399 Centre street. Will rebuild. $15,000 organ destroyed. $5,000 electrically controlled chimes. All covered by insurance.

Three storey office and light manufacturing building, 146 St. Urbain, owned by Succession David Ouimet, 8th Floor, 136 St. James, destroyed by fire. Loss, $25,000. Owner will rebuild shortly after appraiser gives estimates.

Ottawa, Ont.
Hall, etc., Albert, owned by J. H. Ferguson, 590 Gilmour street, destroyed by fire. Solid brick building. Loss $55,000. A business block with stores is contemplated.

Tenement row, Elizabeth, owned by Wm. Tucker, 46 Elizabeth street, destroyed by fire. Loss $8,000. Will rebuild.

St. John, N.B.
Grish mill, City Road, owned by J. Harvey Brown, 2 Mill street, c/o W. Lafontaine Com. Academy, 86 St. Catherine W., destroyed by fire. Loss $20,500. Machinery destroyed. Owner may rebuild.

Sarnia, Ont.
Grain elevator, Point Edward, of Point Edward Elevator Co., destroyed by fire. Loss $400,000. Interested, G. T. R. and Thos. Cook, Thos. Kennedy, Sarnia.

St. Joseph Du Lac, Que.
Hotel owned by Victor Labelle destroyed by fire. Loss $12,000. Insured, will rebuild.

New Companies

General Power Corporation, Limited, was incorporated recently with a capital of $5,000 for the purpose of manufacturing and using electricity for producing light, heat, power or other purpose. The head office is at Toronto and the privisional directors are R. W. Hart, G. M. Miller, Pearl Stokes, Elsie Sutherland and Elizabeth Glen.

The Kipawa Power Company, Limited, has been incorporated with a capital of $1,000,000, for the purpose of acquiring and developing water powers and the developing and distributing of electricity in all its forms. The head office is to be at Toronto and the incorporators are Messrs. W. A. Case, J. B. Taylor, D. D. Fish, J. A. Christlaw and C. G. Lynch.

The Canadian Metal Manufacturing Company, Ltd., has been incorporated with a capital of $30,000, for the purposes of manufacturing and installing heating and ventilating apparatus, and other metal goods and to contract for any kind of metallic roofing. The head office is to be at Montreal and the incorporators are Messrs. F. W. Montgomery and J. K. Wells, Boston, Mass., and L. E. Urquhart, E. R. Montgomery and T. J. Bryan, of Montreal.

The Canadian Abrasive Wheels Limited, was recently incorporated with a capital stock of $500,000, for the purpose of manufacturing and dealing in abrasive material, machinery, pipe coverings and hardware. The head office is at Dundas, Ont., and the incorporators are Messrs. H. E. Sherk and G. R. Harvey of Hamilton, and Mary Brown, Gertrude McManamy and Ethel Phillips, of Dundas, Ont.

White Rock Water Works Company, Limited, was recently incorporated in British Columbia with a capital stock of $10,000 for the purpose of sinking wells and shafts, to build reservoirs, canals, aqueducts, etc., and to carry on the business of a waterworks company in all its branches. The head office is at Victoria, B.C.

The Crookston Stone Company, Limited, has been incorporated with a capital of $50,000, for the purpose of quarrying, crushing and manufacturing limestone, granite or other rock products. The head office is at Toronto and the incorporators are Messrs. J. A. Jelly, Shelburne, Ont., L. E. Allen, Belleville, Ont., R. Cooke, Harold, Ont., E. B. Price, Toronto, and T. H. Thompson, Madoc, Ont.

The Marsh-Hutton-Powers Company, Limited, has been incorporated with a capital of $200,000, to carry on business as a general land and building company, with head office at Port Arthur. The provisional directors are H. E. D. Hutton, financial agent, L. C. S. Hallam, real estate agent, of Port Arthur.

Electric Supply Company, Limited, has been incorporated in British Columbia with a capital stock of $25,000 for the purpose of carrying on the business of electricians, mechanical and hydraulic engineers. The head office is at Vancouver, B.C.

The Reid Todd Construction Company, Limited, has been incorporated in British Columbia with a capital stock of $10,000, for the purpose of building and operating any and all kinds of public and private works and to carry on a general contracting business. The head office is at Vancouver, B.C.

Napanee Brick and Tile Company, Limited, has been incorporated with a capital of $100,000, to manufacture and deal in all kinds of builders' supplies, with head office at Napanee. The provisional directors are E. M. Young, barrister, of Picton, and Clarence Sands Madill, broker, of Montreal.

Mountville, Limited, incorporated with a capital of $40,000, to carry on business as a general land and building company with head office at Hamilton. The provisional directors are F. W. Reinke, manager, T. M. Chambers, real estate agent, and J. E. Peart, gentleman, all of Hamilton.

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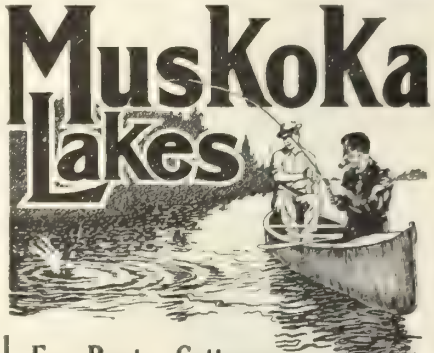

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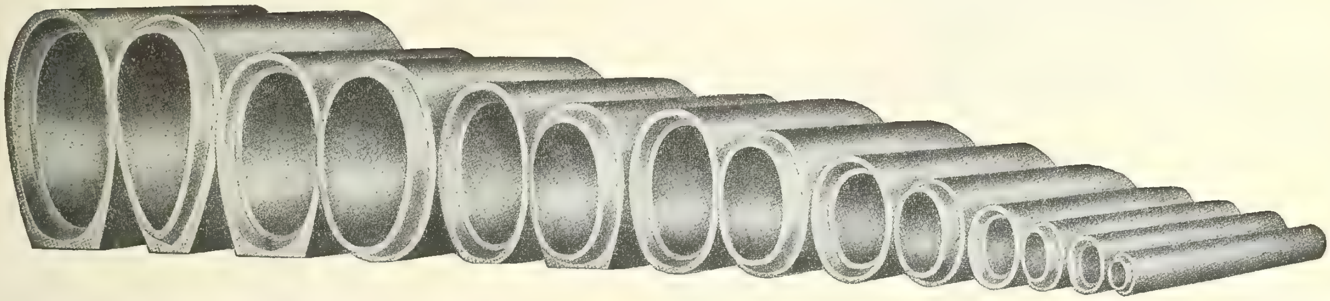

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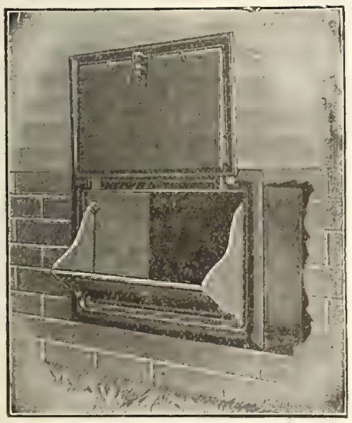

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with one of our "Majestic" Coal Chutes which is the neatest and best equipment for any cellar. It is easily installed in either new or old houses. It permits coal, wood or vegetables to be put into the cellar without disfiguring the building in any way. And unlike a glass window it cannot be broken. The hopper can easily be removed if desired to put in very coarse coal or wood, or if a waggon chute is used. It swings back into the chute and allows the door to be closed. The door is made to lock when opened upward, and protects the wall or siding above the chute, and can be released only when closed. We make three standard sizes. There's a size that's just right for your cellar and your requirements. No. 1—22 x 16 x 13. No. 2—27 x 16 x 13. No. 3—33 x 22 x 18.

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It reflects the light in the darkest rooms and will cut down your lighting bill.
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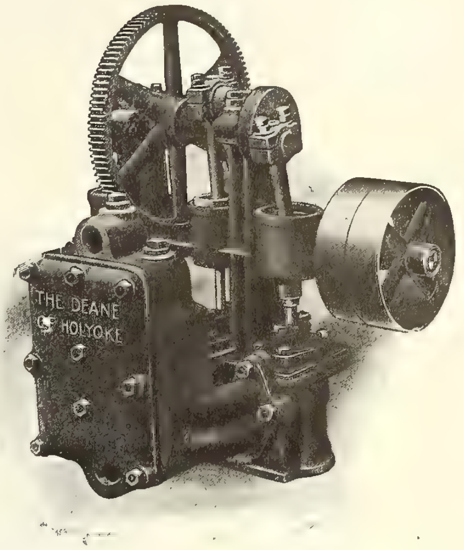

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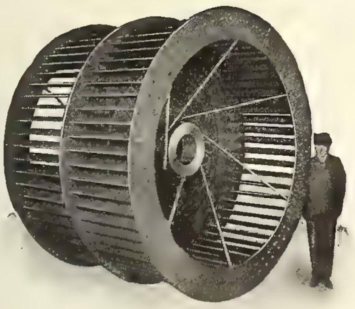

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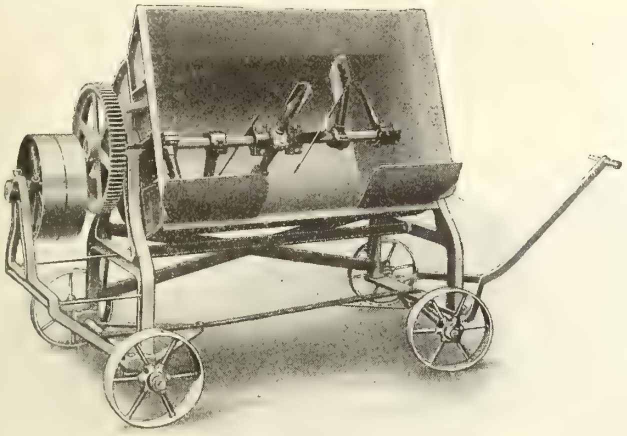

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Strongly Made—Well Balanced **Easy to fill—Easy to Dump**

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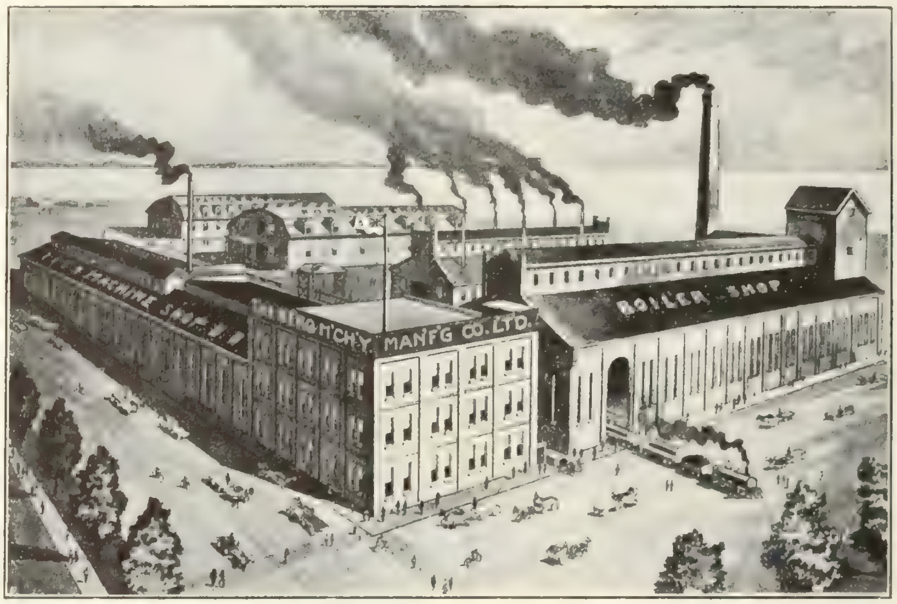

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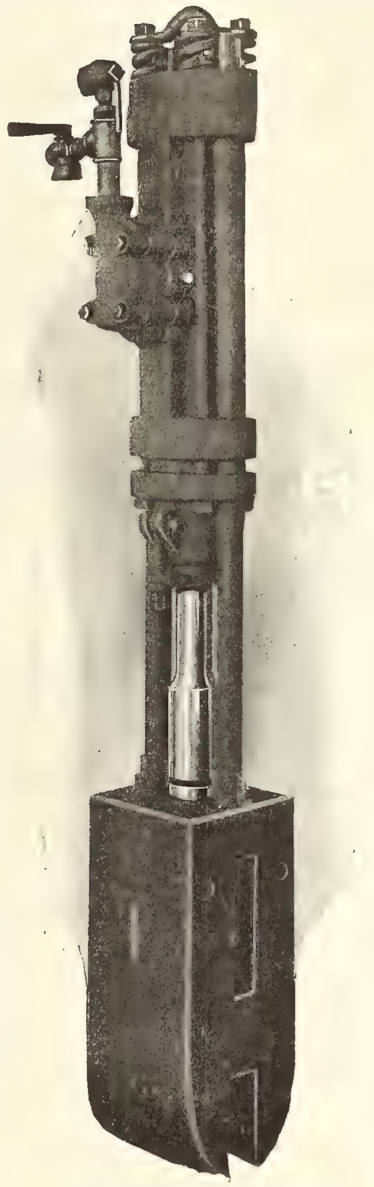

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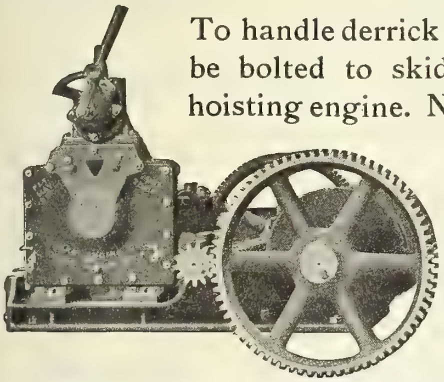

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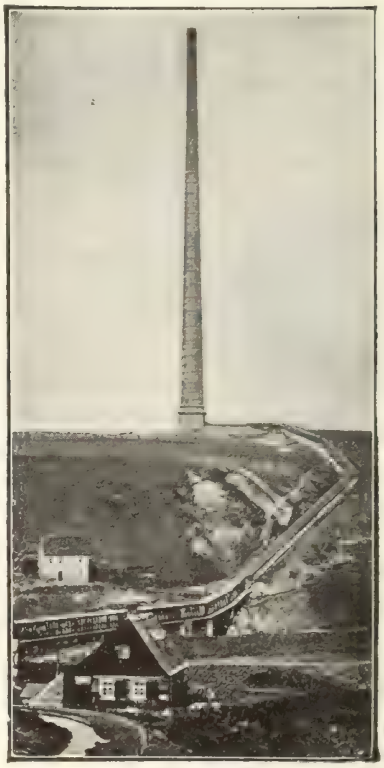

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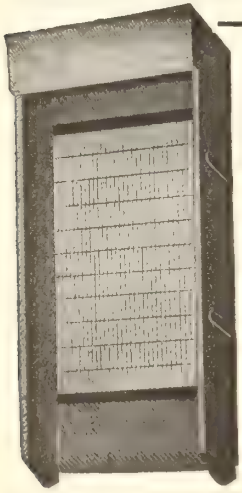

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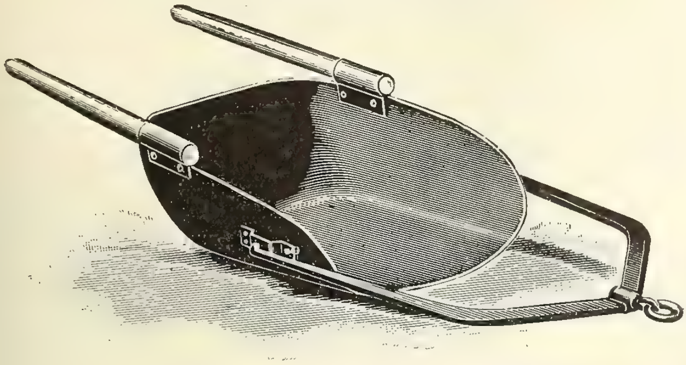

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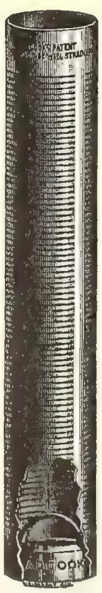

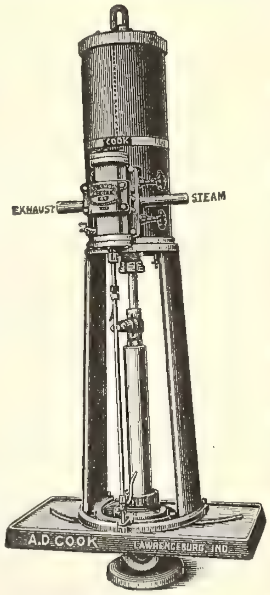

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is obtained at a minimum cost by use of our deep well pumps.

Write for Bulletin 26 explaining the use of Cook's Patent Brass Tube Well Strainer.

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Lawrenceburg, Indiana, U. S. A.

Manufacturer of a Complete line of **DEEP WELL SUPPLIES** including Steam, Belt and Motor Driven **DEEP WELL PUMPS**, Wind-mill and Hand Pumps, Working Barrels and Valves, Pump Rods and Pump Rod Joints, Drill Rods and Drill Rod Joints, Drilling and Well Tools.

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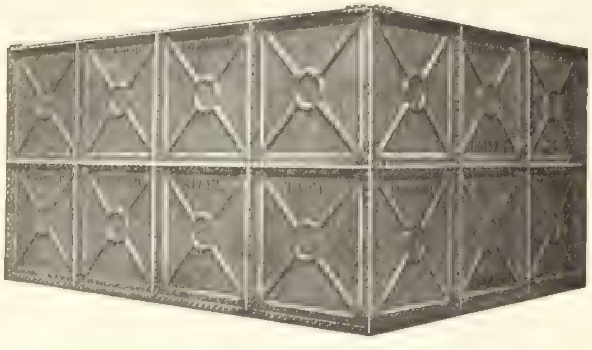

Made in any length or width in multiples of 4-ft. by 8-ft. or 12-ft. deep.

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are built up of plates 4 ft. square by 5/16th in. thick. There are only three types of plates and all are interchangeable. Easily erected by unskilled labor.

LIGHT. STRONG. CHEAP. UNBREAKABLE.

IMMEDIATE DELIVERY FROM STOCK.

STEEL PIPES—Welded or Rivetted

of any diameter over 12 inches and having any desired type of joint.

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Are you satisfied with your wheelbarrows, if not you can purchase the "Bull Frog" brand from Dominion Equipment & Supply Co. of Winnipeg, London Concrete Machinery Co., Ltd., London, Ont. and E. P. Jamison & Co., Ltd., of Vancouver, and be assured of satisfaction.

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Producers of Dark Hollow Buff and Blue
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from our quarries has been used in many of the largest public buildings, churches, etc., in the United States and Canada.

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Wonders Will Never Cease

Here's the latest addition to the WONDER line of Concrete Mixers. This Side Loader practically doubles the capacity of the LITTLE WONDER "FIVE" and the WONDER "TEN." The neck of the bucket is wide. Materials slide easily and rapidly into the drum without poking or pounding. When elevated, bucket is in almost vertical position and does not hinder moving about. Frame is light, scientifically braced and very strong. Control levers grouped so one man loads the drum, tilts and dumps it and attends to engine.

The LITTLE WONDER "FIVE" has capacity of five cu. ft. per batch and turns out 35 to 50 cu. yds. per day without Side Loader. It is famous all over the world as the original small Tilting Drum Batch Mixer. You ought to have it, with or without Side Loader, according to your need. Our "Man to Man" proposition, which includes

Absolutely Free Trial

and easy payments, makes it almost a crime for any man who does concrete work and wants to make money, to be without it. This new combination gives you at low cost a mixer that will do any job that offers, yet is the swiftest and most economical machine for the smallest work. Once you know its simplicity, strength and speed you will not hesitate. It doesn't cost you a cent to find out, because we even pay the freight if you are not satisfied in every particular. Write for our "Man to Man" Proposition.

Canadian Representatives Wanted

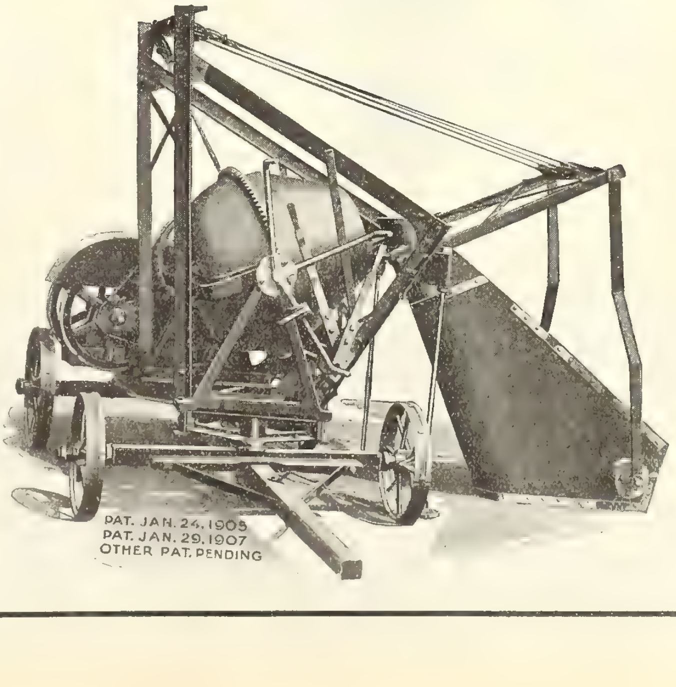
Waterloo Cement Mach'y. Corp'n.
117 Vinton Street, Waterloo, Iowa

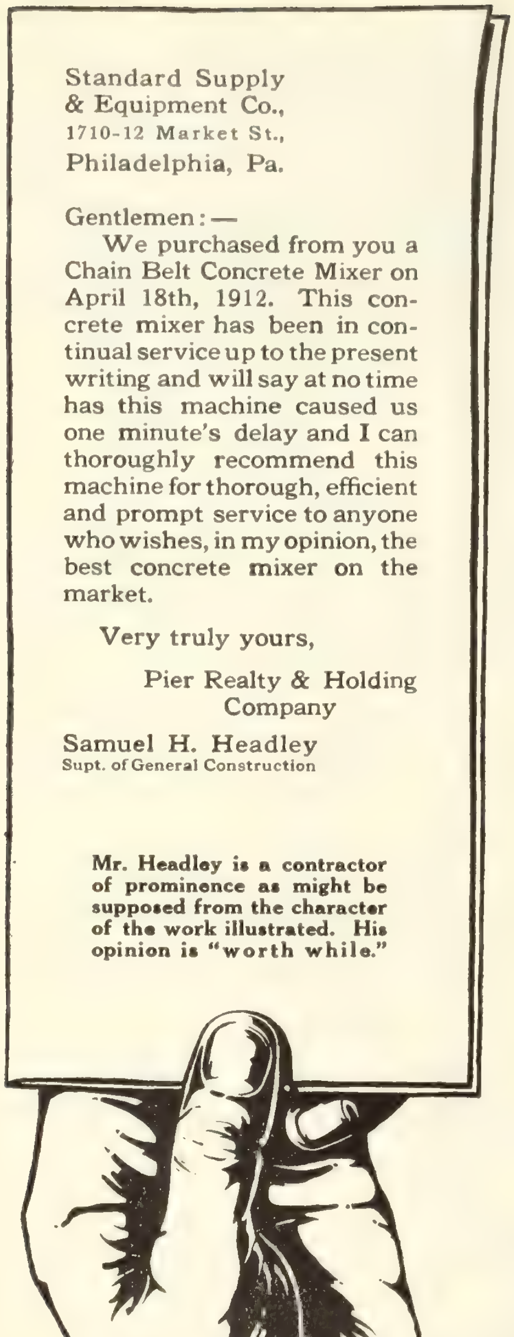
Look at the

Little Wonder "Five"

with the NEW

Side Loader





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& Equipment Co.,
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Gentlemen: —

We purchased from you a Chain Belt Concrete Mixer on April 18th, 1912. This concrete mixer has been in continual service up to the present writing and will say at no time has this machine caused us one minute's delay and I can thoroughly recommend this machine for thorough, efficient and prompt service to anyone who wishes, in my opinion, the best concrete mixer on the market.

Very truly yours,

Pier Realty & Holding
Company

Samuel H. Headley
Supt. of General Construction

Mr. Headley is a contractor of prominence as might be supposed from the character of the work illustrated. His opinion is "worth while."

The Builder of the $500,000 Concrete Pier at Atlantic City Considers the Chain Belt Mixer

"THE MIXER WITH THE BULGE."

The Best Concrete Mixer on the Market

THE mixer was placed in service on the pier project and how well it did the work is shown by the foregoing testimonial.

Work of this character is pretty good evidence of the capacity and efficiency of a concrete mixer. The pier in question extends more than a third of a mile out to sea. The construction, therefore, must be of the most substantial kind. The concrete must be of high grade and of uniform quality. The Chain Belt Mixer was the mixer selected to produce it.

The work must be rapid. The Chain Belt Mixer is one of the lighest-running and fastest machines built. It therefore met that requirement.

There must be no interruptions due to breakdowns, etc. Chain Belt Drive and the Chain Belt Mixer constructions generally are the best possible assurance against breakdowns and loss of time. Hence, the Chain Belt selection on those grounds.

The season will be in full swing almost before you know it. Better order that Chain Belt Mixer now. What size do you require?

CHAIN BELT COMPANY

MILWAUKEE, WISCONSIN

Dominion Equipment & Supply Company,
Winnipeg, Manitoba, and Vancouver, B. C.

Atlantic City Pier in Course of Construction. Completed, it will have cost $500,000. It will extend 2,000 feet seaward and is being constructed almost entirely of reinforced concrete. Samuel H. Headley, Contractor. Chain Belt Mixer used.

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Timber Preservers and Fireproofers

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Sole owners of the B. M. patent process of lumber preserving.

British Method **Best Method**

Flowing Water Well at Barrie, Ont

Drilling Contractors

Water, Salt, Oil, and Gas Wells

Drilled to any depth and to any size diameter. Estimates furnished. Contracts taken in any part of Canada. Water Wells drilled by us are supplying towns and cities all over Canada with pure, clear water.

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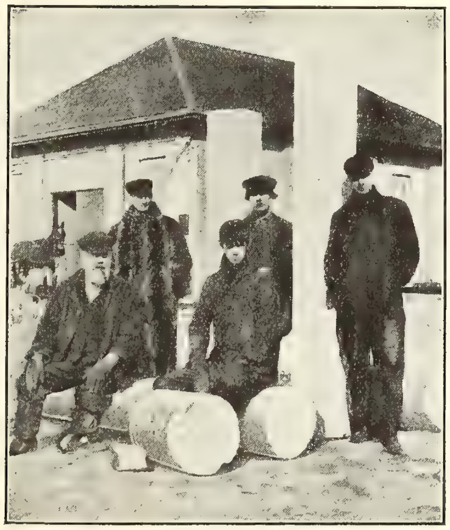

Ore Crushers
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Air Compressors
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The 16 in. hard limestone cores shown above were taken out by one of our Type "C" McKiernan-Terry core drills, operated by the Corporation of Winnipeg.
This Drill is capable of boring any size holes up to 30 ins. in diameter.

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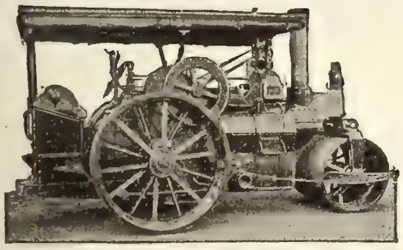

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All sizes.

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Bridges, Roof Trusses, Columns, Girders, Beams, Towers and Tanks, Penstock.

Estimates furnished promptly. Capacity 18,000 Tons Annually.

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Shingles stained with Cabot's Shingle Stains, stucco stained with Cabot's Waterproof Cement Stains, and lined with Cabot's Quilt, for warmth.

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The Standard Stains for Shingles, Siding or Trimmings. The first shingle-stain ever made, and quality guaranteed by thirty years' use. Made of the strongest and finest colors, ground in pure linseed oil, and Creosote, "the best wood preservative known," No cheapeners, no adulterations, no kerosene or benzine.

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The warmest lining. Heat-proof. Cold-proof. Sound-proof. Uninflammable, non-decaying, vermin-proof. Insulates cold-storage and ice-houses, and all other buildings. Deadens sound in floors and partitions.

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For waterproofing and tinting stucco and similar cement surfaces, and for freshening, restoring and waterproofing bricks.

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For preserving ties, poles, planking and all other lumber.

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For direct plastering on brick or concrete without studding or lathing. Forms a perfect permanent and impervious bond.

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Strongest, finest and most lasting.
Send for Samples and Prices.

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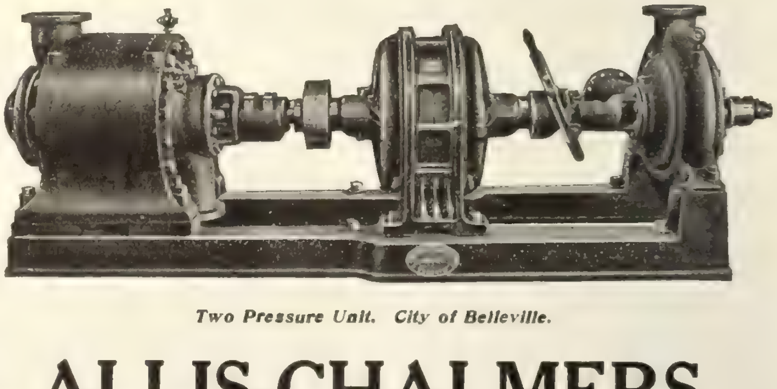
FOR WATERWORKS PURPOSES

Nearly all waterworks for municipalities require two pressures, Domestic and Fire. The arrangement illustrated is one method of conveniently attaining this end and maintaining the highest efficiency for domestic purposes. The left hand pump is the domestic pump and delivers 1000 imp. gallons per min. against 100 lbs. In case of fire the clutch is thrown in and 125 lbs. is immediately obtained. When making out your specifications insist on maximum efficiency against domestic pressure.



Two Pressure Unit. City of Belleville.

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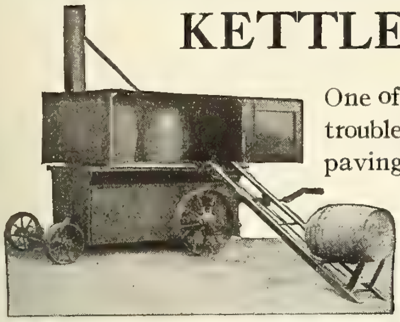

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of all types and sizes, Heaters, Tanks, Pumps, etc.

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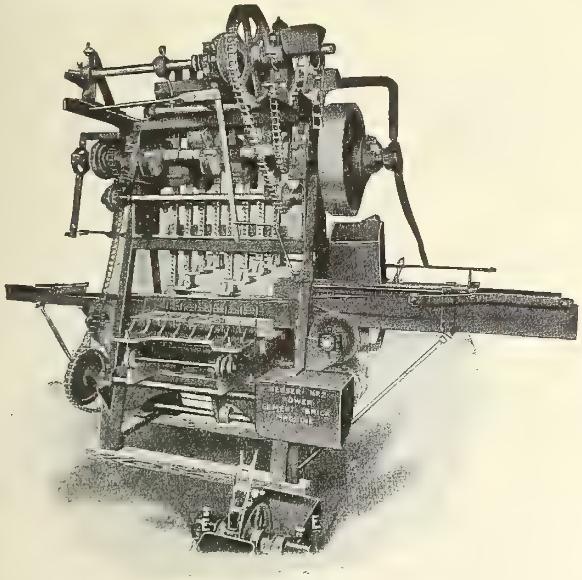
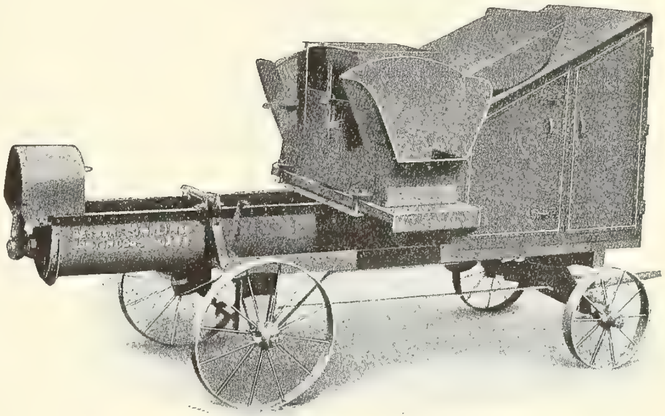


Besser Power Cement Brick Machine



Besser Simplified Continuous Mixer

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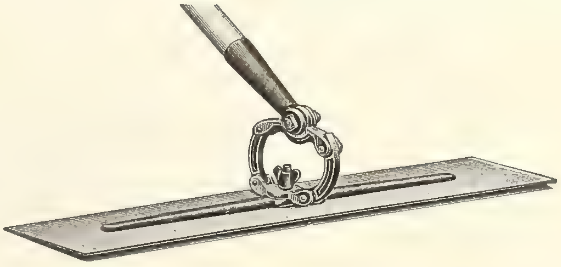

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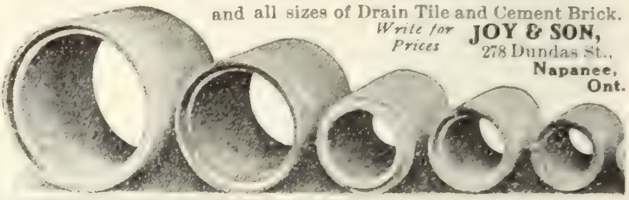
Large stock I Beams, Channels, Angles, Tees, Zees, and Plates always on hand.



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and all sizes of Drain Tile and Cement Brick.
Write for Prices JOY & SON,
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TILES

Moulded and burned to a suitable hardness at our Elmsdale works. Scotia Tiles are suited for farm, railway and other drainage work where a strong and lasting tile is required.

Prices and particulars on request.

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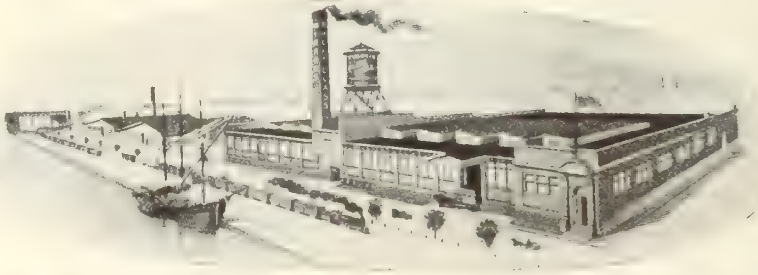

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THE TORONTO PLATE GLASS IMPORTING COMPANY, LIMITED
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We manufacture blocks of the highest possible standard, the very best materials only being used and in the DOMINION WOOD BLOCKS we believe we produce an article that has no equal.

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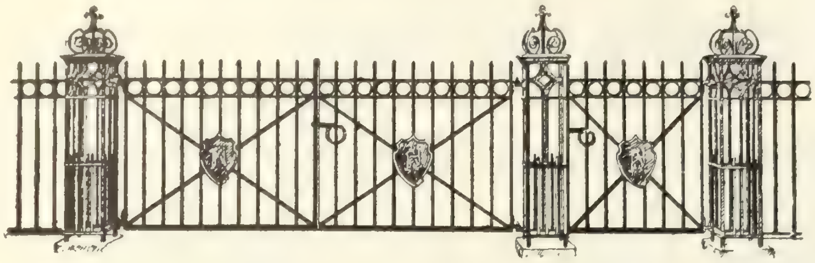

If you have any special designs, monogram plates or particular work in ornamental iron, you can depend upon us to faithfully fashion your designs.

Prices and Particulars cheerfully furnished.

WE ALSO DO IRON STAIR WORK

The Geo. B. Meadows

Toronto Wire, Iron & Brass Works Co., Limited

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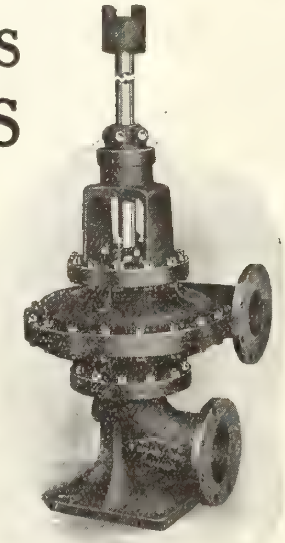
MEADOWS' BLOCK, WELLINGTON ST. WEST

WATEROUS PUMPS



Waterous Pumps are designed and constructed for compactness durability, and ease of operation.

We build both Vertical and Horizontal types in all sizes up to 7000 gallons per minute pumping capacity. They can be belt, engine or motor driven.

Split reversible barrel, split packing gland, a smooth running slow wearing fan, and the ability to handle water containing up to 20% suspended matter, are Waterous features.

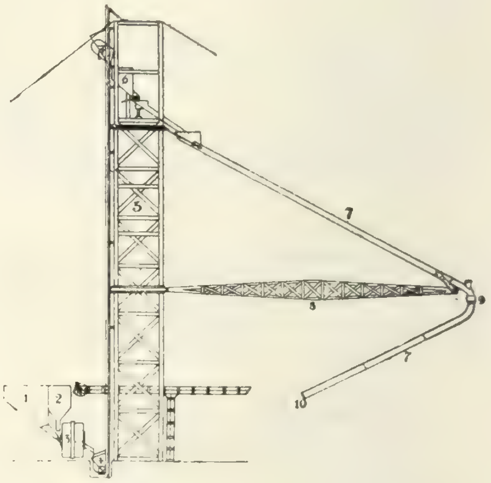
One For Every Service

No matter what kind of pumping you are doing—Mine Drainage, Coffer-dam, Irrigation, Sewage, etc.—We have the right pump and the best pump for your work.

Bulletin No. 200

The Waterous Engine Works Co. Limited

Brantford, Canada



Gravity System
Distributing Concrete

A system that improves the concrete and reduces the cost.

Information gladly furnished and Estimates given on any work.

Canadian Concrete Appliance Co. Limited

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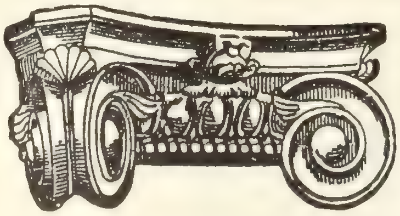
STINSON REEB BUILDERS' SUPPLY CO., LTD., MONTREAL, P.Q.

Our Patent Wainscot Cement



Centre Pieces, Brackets, Veranda Capitals and Freizes. Claphams Grey Wainscoat Cement Finish for Bathrooms, Kitchens, Lavatories, etc.

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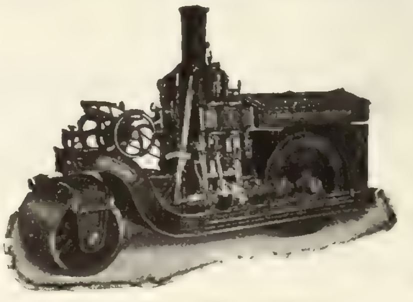

"Our 20th Century Roller"

Send for our Catalogue of Asphalt Rollers and Mixers.

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Heating Problems

for next Winter

and it's better to have them all settled ahead of the coming of cold weather. We make a specialty of matching heating systems to suit conditions. So, if you are installing new plant or want more efficiency from your present outfit

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Heating Apparatus in the

Ordnance Shop No. 4 of the Midvale Steel Co., Nicetown, Penn.

This shop has a content of about 5,250,000 cu. ft. It is heated by four apparatus, one in each corner of the building. Each apparatus consists of an 8 x 4 Sturtevant fan driven by 8 x 12 Sturtevant Steam Engine. Each fan operates in connection with Sturtevant Pipe Coil Heater arranged for Exhaust Steam.

The fans discharge the heated air into the galvanized iron duct which runs entirely around the inside walls and delivers the air at intervals through short spouts.

The building is heated to 65 degrees F. in zero weather, and the air is completely changed every thirty minutes.

The Sturtevant Heating and Ventilating System is positive in action, combines ventilating with heating, costs less to operate, and does away with troubles from scattered piping.

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B. F. Sturtevant Co. of Canada, Limited
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"BRADFORD PRESSED BRICK"

Trade Mark Reg. U.S. Pat. Office

IS THE LEADING RED BRICK IN AMERICA

"BRADFORD REDS"

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They are made of an unfading, natural red shale, distinctive as to shade and quality, uniform in size and represent the best that skill and long experience can offer.

We are just issuing a new Red Catalog "D" which we shall be glad to mail upon request

Bradford Pressed Brick Company *The Red Brick People*
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Daylight Costs O O O

BY means of accurately formed glass prisms you can have your building flooded with sunlight all day. Not merely at the windows but perfectly distributed to the darkest portions of the building.

The one best way to get such results is by the use of

Luxfer Prisms

Other prisms will admit daylight but Luxfer puts daylight where you want.

Always specify Luxfer—the first and best prism.

LUXFER PRISM COMPANY, Limited

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Storage Houses Oil Houses

¶ We have the best possible facility for making all kinds of storage houses of one storey, no matter of what dimensions.

¶ We will undertake to furnish and erect such buildings complete ready for occupancy.

¶ No steel building is too small or too large for us to figure on.

¶ We shall be pleased to furnish estimates and sketches on this class of work at any time. Write us and tell us what you need and we will prepare estimates for you at once.

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The Metal Shingle & Siding Company, Ltd.

Associated with

The A. B. Ormsby Company, Limited

Montreal, Toronto, Preston, Winnipeg,
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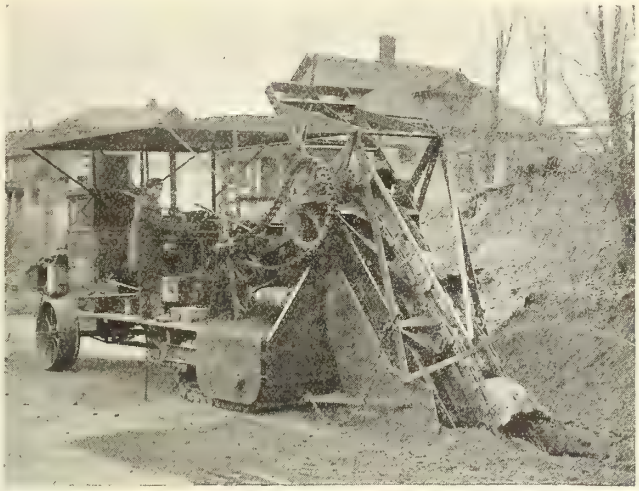

The man who is making money in trench digging—today

is the man who has dropped old-fashioned pick-and-shovel methods and availed himself of the economies offered in modern trench digging machinery. Just look around and see!

And the contractors who have a margin on every other competitor are those using—

AUSTIN TRENCH EXCAVATORS

Again—just look around and see! Or better still, write and let us give you the evidence in written form.

Some of the individual "points" of the AUSTIN, which give the man who uses it his "margin," are its self-cleaning buckets, light weight strength for strength, all-steel wearing parts, and multi-pedal traction.

All fully described in Catalog 108-A

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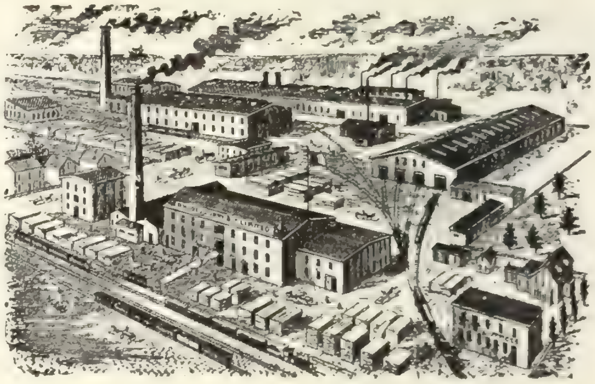

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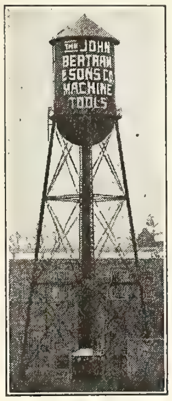

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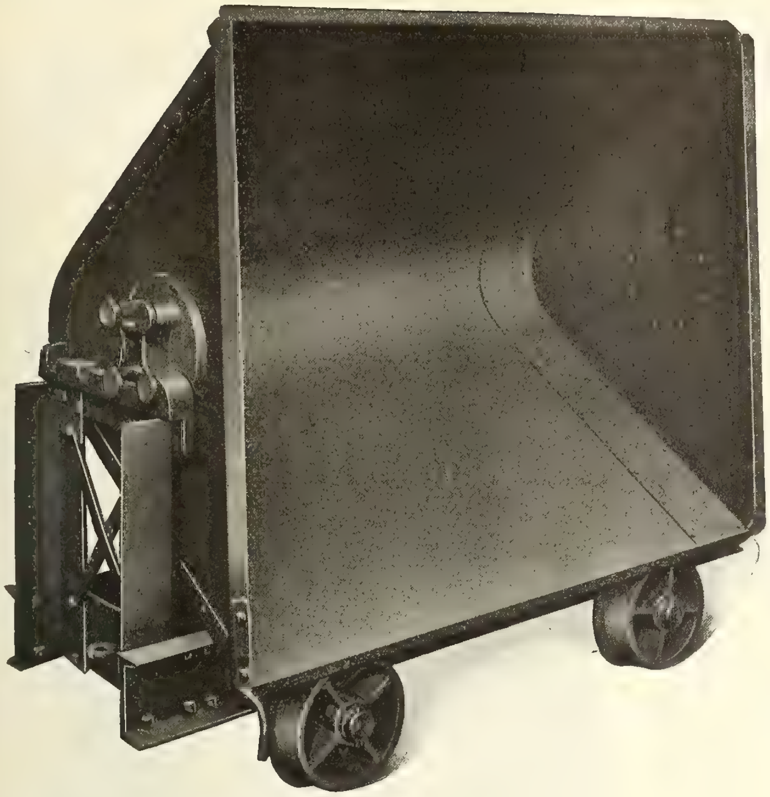

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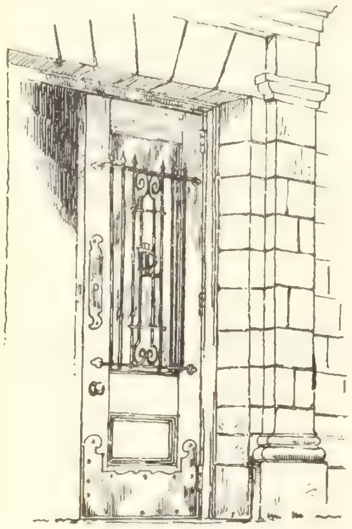

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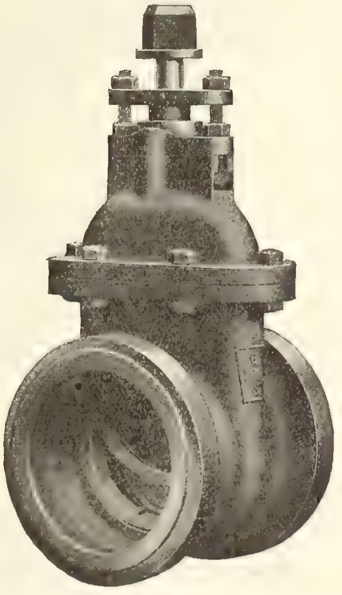

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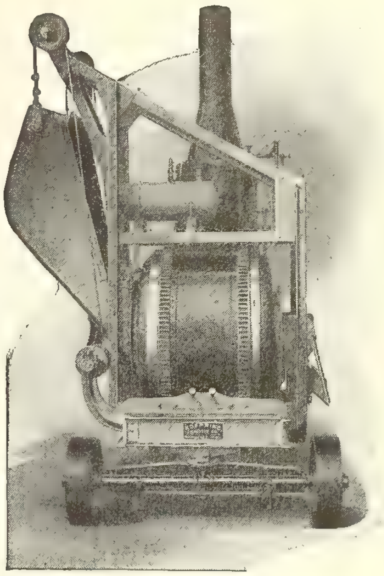

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	Per M
No. 1 dry pressed red brick	$18 00
No. 1 dry pressed buff brick	18 00
Red Stock Bricks	13 00
Grey Stock Bricks	13 00
Wire cut bricks for foundation work ...	12 50
Porous terra cotta bricks	15 00
No. 1 enamelled bricks, all colors, from	$80 00 to $150 00

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Hemlock Lumber—

2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$27 00	
2 x 4 to 2 x 12, 16 ft.	27 00	
2 x 4 to 2 x 12, 18 ft.	26 00	30 00
1 in. Hemlock, No. 1	26 00	28 00
No. 1 Hemlock Decking	24 00	28 00
No. 2 Hemlock dimension and 1-in.	20 00	22 00

Pine—

1 in. common pine 8 to 12 in. wide rough	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
⅞ x 8 and 10 in. pine shelving..	36 00	42 00
⅞ x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine desking D2S	30 00	
Spruce Decking	28 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

Pine trim for paint finish—

4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8-in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

Shingles—

XXX B. C. Clear Shingles, per M.	3 90
N. B. Extras	3 75
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No. 1 pine lath, per M.	5 00
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No. 1 spruce lath	4 00

Cedar Posts—Fence—

5 in. at small end, each	30
7 in. at small end, each	35
Hemlock lath	3 50

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	Star	D.D.
10 to 25 united inches	$4 25	$ 6 25
26 to 40 “	4 60	6 75
41 to 50 “	5 10	7 50
51 to 60 “	5 35	8 50
61 to 70 “	5 75	9 75
71 to 80 “	6 25	11 00
81 to 85 “	7 00	12 50
86 to 90 “		15 00
91 to 95 “		17 50
96 to 100 “		20 50
101 to 105 “		24 00
106 to 110 “		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for box lots:—

MONTREAL

	Star	D.D.
25	$3 25	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
90		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

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	4ths Single	3rds Double
Up to 25 u.i.	$3 50	$5 00
26/40	3 75	5 50
41/50	4 25	6 25
51/60	4 75	7 00
61/70		8 00
71/80		9 00
81/85		10 00
86/90		11 00
91/95		13 00
96/100		16 00

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No. 4½ Fuller's .... net $2.50

Square head brass cocks, 65 per cent.

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Lead pipe, $7.50, less 10 per cent.; lead waste, $9.00, less 10 per cent.; caulking lead, 6¾ cents per lb.; traps and bends, 35 per cent.; pig lead, 5¾ cents per lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.28	¼ inch	$3.18
⅜ “	2.28	⅜ “	3.18
½ “	2.72	½ “	3.57
¾ “	3.28	¾ “	4.43
1 “	4.85	1 “	6.55
1¼ “	6.56	1¼ “	8.86
1½ “	7.84	1½ “	10.59
2 “	10.55	2 “	14.25
2½ “	16.67	2½ “	22.52
3 “	21.80	3 “	29.45

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

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Medium and extra heavy pipe and fittings, up to 6-inch, 60 and 5 per cent.

7 and 8-inch pipe, 45 per cent.

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4-in.	25c ft.	15-in.	1.35 ft.
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9 in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

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Burnt River rubble stone delivered, $17 to $18 per toise.

Plain steel bars, $2.25.

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Sand, for cement or brick work, $1.15 a cubic yard, f.o.b. Toronto, C. P. R. sidings.

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Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

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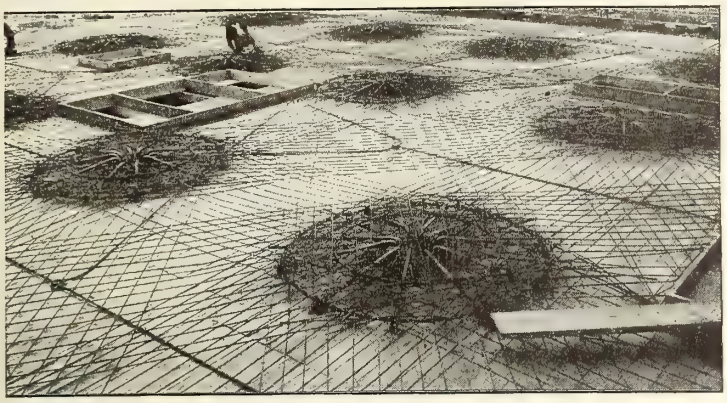

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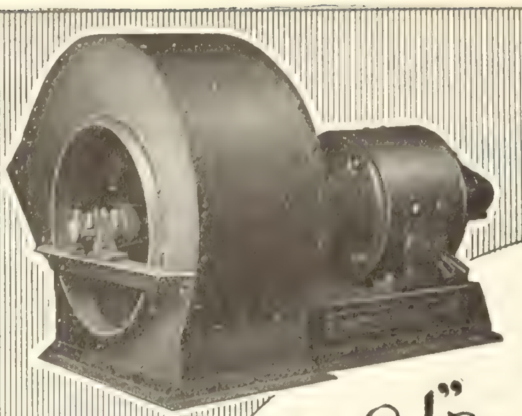
Wire Rope Grease

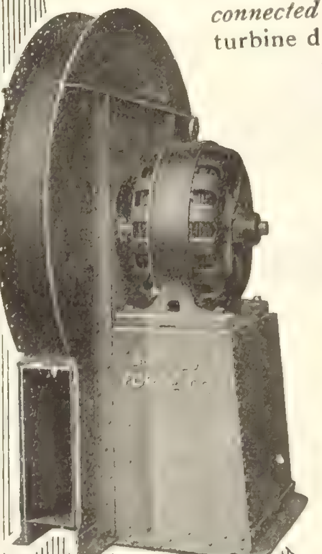
The B. Greening Wire Co. Limited
Hamilton, Ont. Montreal, Que.



"Buffalo" Fans

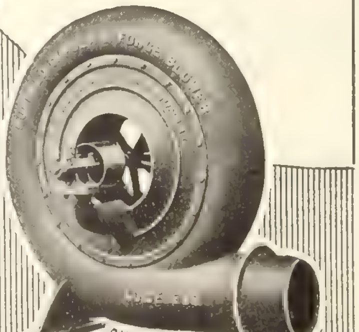
For Heating, Ventilating, Drying and Exhausting.

Ask our engineers to recommend the fan best suited to your requirements. Our designs include the new high-efficiency "*Conoidal*" multiblade fan, used extensively for heating systems, mine and tunnel ventilation, and the motor-driven *Steel Plate Pressure Blower*, giving pressures up to 24 oz. Both of these designs show higher efficiency than obtained with any similar types. We specialize in *direct-connected* units (motor, engine or turbine driven) for every service. These are distinguished by absence of belt troubles and the very lowest power consumption. Whatever your problem write us.



CANADIAN BUFFALO FORGE CO., Limited

Montreal
St. John Toronto
Winnipeg Vancouver



Structural Water-proofing

"DEHYDRATINE"

For Water-proofing under the membranous method.

"HYDRATITE"

For Water-proofing Concrete.

"FERRO FAX"

For Surface Hardening Concrete Floors.

"SYMENTREX"

A Cement Coating—Makes Surfaces Water Shedding.

MADE IN COLORS

"These Trade Names protect you against the possible selection of inferior materials. Whether you prefer a water-proof paint or a compound, we can give you satisfactory assurance as to the reliability of these products."

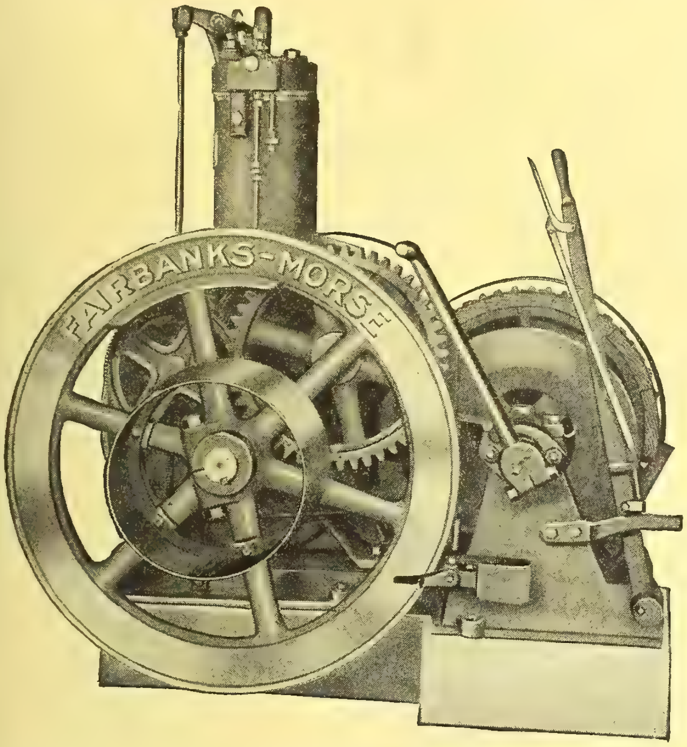
"FOR 15 YEARS STANDARD OF THEIR KIND."

Pinchin-Johnson & Co.
(Canada) Limited
Minerva House, - Toronto

Write for Particulars and Architect's Hand Book (1913 edition)

AGENCIES IN ALL CITIES

Vertical Geared Hoisting Engine



The Fairbanks-Morse Type "T" Vertical Geared Hoisting Engine shown here is one of the most economical, durable and efficient hoists on the market. This is a 6 h.p., but they are made in sizes from 2 to 12 h.p. They are regularly fitted for gasoline, benzine or naphtha, but can be furnished to operate on oil or alcohol.

The drum runs loose on the shaft, while the large gear is keyed fast. A friction clutch mechanism, with conical surfaces, is mounted on the drum, which enables the load to be handled quickly and positively by means of a hand lever. The gearing connecting engine to the hoist drum can be thrown out of mesh, when it is desired to use the engine for other purposes.

Always Satisfactory for

Contractors
Building construction
Excavating
Handling Materials
Pile Driving
Operating Derricks
Trestle construction
Bridge Building
Mining
Prospecting
Well Drilling
Car Pulling
Ice Handling
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Mason contractors
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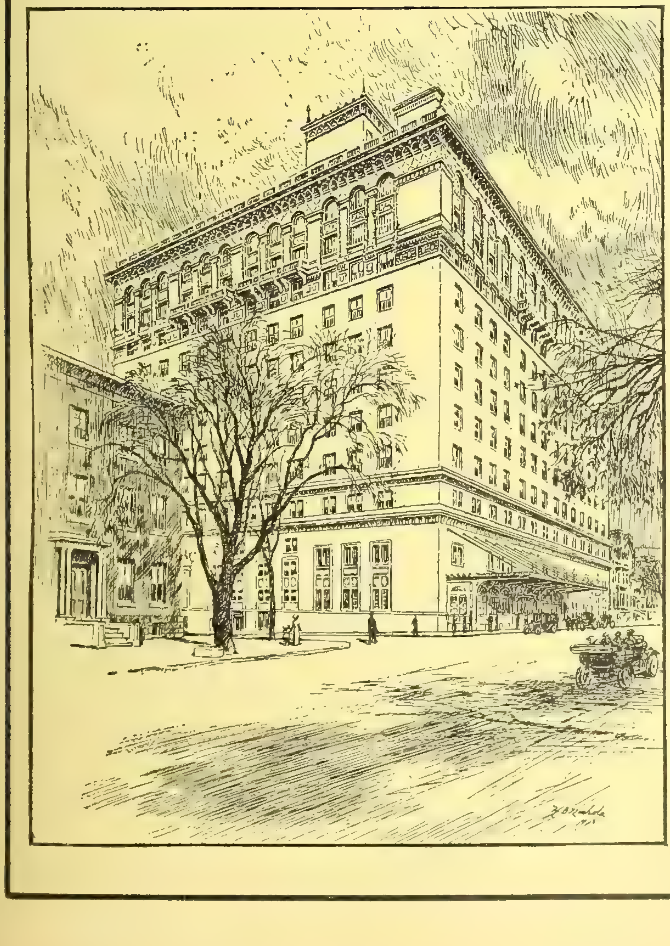
Cable Laying
Telephone construction
Handling Lumber
Cane Loading
Operating Hay Fork
Handling Sacked Grain
Loading and Unloading at Docks and Warehouses

Write for further particulars

The Canadian Fairbanks-Morse Company, Limited

Montreal St. John Ottawa Toronto Winnipeg
Calgary Saskatoon Vancouver Victoria 1



Across Canada with the Imperial Wire & Cable Company, Limited

Toronto Montreal Winnipeg

First of a series of advertisements showing buildings of national importance which have been wired with Imperial Wire & Cable Co.'s, Limited, wires.

This picture shows

The Ritz-Carlton Hotel, Montreal

Architects—Warren & Wetmore—New York.
Engineers—Mailloux & Knox—New York.
Electrical Contractors — J. Livingston & Co. —New York.

This hotel was wired with "Imperial" Higrade Rubber Insulated Wire.

Address enquiries to nearest office, Montreal, Toronto, Winnipeg; Alberta and British Columbia enquiries to Northern Electric & Manufacturing Co., Limited, Calgary and Vancouver.

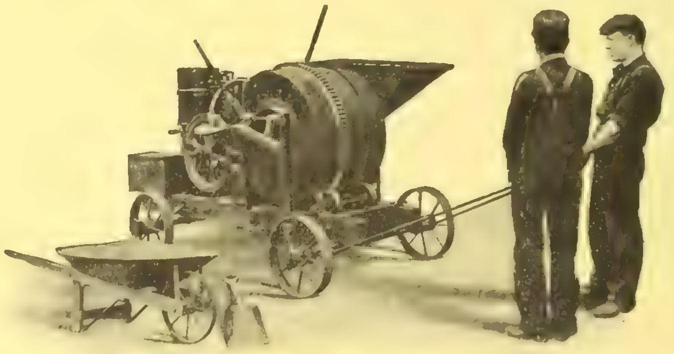
Everybody Who Builds

Concrete Walls, Concrete Walks or Curbs, Concrete Anything

can have the best Concrete that can be made at the least possible cost

BECAUSE

Our No. 4 RANSOME MIXER



No. 4 Ransome Concrete Mixer.

is the equal of our larger machines in efficiency and is sold at a price which makes it an easy and a wise purchase for anybody.

It has a batch capacity of 4 cubic yards per hour, which is ample for any small concrete job. No. 4 Mixers are sold in one way only : i. e.—mounted on Trucks, with gasoline engine, direct drive. This is a powerful engine for its rated H. P. and the best designed—a most perfect operating engine.

The No. 4 Ransome is a great time saver in every respect. As we equip these machines with a special batch charging hopper, which is being filled while the batch in the drum is mixing—no time is lost in charging drum. By the simple lever arrangement, the whole unmixed batch is fed into the drum in an instant and the loading gang keeps right on with their work without any waits whatever. The batch is instantly discharged by merely reversing the discharge chute.

Let Us Send You Particulars

F. H. Hopkins & Co.

MONTREAL

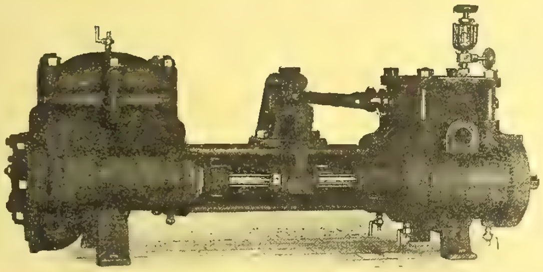
BRANCH OFFICES: **General Supply Company of Canada, Ltd., Winnipeg Agents**
Ritchie Contracting & Supply Company, Ltd., Vancouver Agents

Vol. 27 Toronto, July 23, 1913 No. 30

ESTABLISHED 1886

Contract Record and Engineering Review

Steam and Power Pumps, Condensers and Travelling Cranes



The Smart-Turner Machine Co. LIMITED
HAMILTON, CANADA

"MADE IN CANADA"

Bent Glass

Made in all Kinds of Glass on Short Notice

Large Bent Plate Glass for Shop Fronts a Specialty

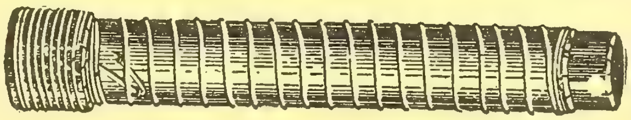
The Toronto Plate Glass Importing Company, Limited
(HILL & RUTHERFORD, Managing Directors)
Head Office and Works: 91 to 133 Don Roadway
TORONTO

INGERSOLL-RAND
SHEET PILE DRIVERS

—Prove the Value of Experience.
—Utilize all the Energy.
—Have Standard Mechanism.
—Are Handled with Facility.

Send For K-139.

Canadian Ingersoll-Rand Co., Limited
MONTREAL, CAN.



Continuous and Machine Banded Wood Stave

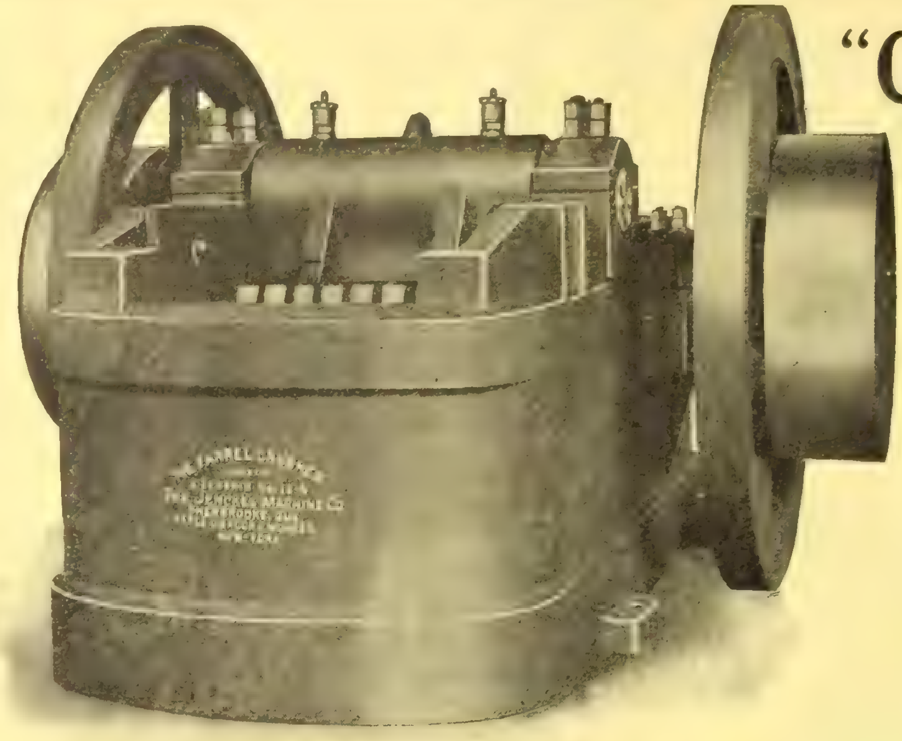
WATER PIPE

RESERVOIR TANKS

for city and town Water Systems, Fire Protection, Power Plants, Hydraulic Mining, Irrigation, etc. One-half the cost of Iron Pipe—and better.

Pacific Coast Pipe Co., Limited
P. O. Box 563 Vancouver, B. C.
Office and Factory, Granville St., near High Bridge
WRITE FOR CATALOGUE
Full Particulars and Estimates Furnished

Alphabetical Index of Advertisers, Page 16 Classified Directory to Advertisements, Page 6



"CRUSHERS"

Complete Crushing Plants

Our Specialty

Many Years Experience and Exceptional Facilities

Ask for Copy of New Catalogue

THE JENCKES MACHINE COMPANY, LIMITED

General Offices: Sherbrooke, Que. Works: Sherbrooke, Que. - St. Catharines, Ont.

Sales Offices:—Sherbrooke, Montreal, St. Catharines, Cobalt, So. Porcupine, Vancouver, Nelson

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THE LEDGER

COLUMBUS, GA., SAYS:

"The Hardaway Contracting Company is one of the oldest and most experienced hydraulic engineering concerns in the South. It has succeeded in building up a splendid organization, and has acquired equipment of the most modern and up-to-date type for handling its large contracts with **promptness and efficiency.**"

This equipment includes:

43 "American" Steel Derricks

Ten of them are shown in the picture at work on the 99 Islands Dam, built by Hardaway Company near Blacksburg, S.C. With these "**10 American Steel Derricks**" the Contractors say they laid on an average of 1,320 cu. yds. of masonry each 10½ hour day.

If you need a **Steel Derrick** in which is embodied everything that will assist you to economically produce the greatest amount of high grade work, let us tell you all about the **"American."**

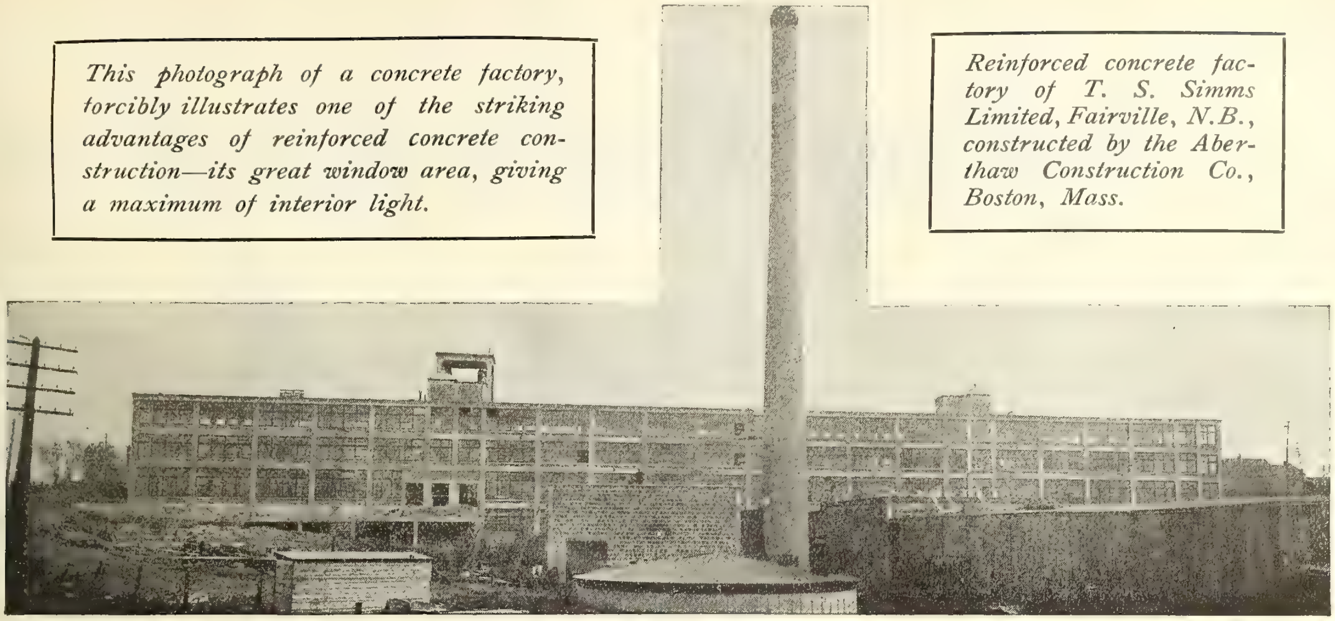
American Hoist & Derrick Co.

ST. PAUL, MINN., U. S. A.

Gorman, Clancey & Grindley, Edmonton, Calgary and Nelson, B.C.
Vancouver Machinery Depot Ltd., Vancouver, B.C.
Stuart Machinery Co., Ltd., Winnipeg, Man.
General Supply Co. of Canada, Ltd., Montreal, Ottawa, Toronto, Can.

This photograph of a concrete factory, forcibly illustrates one of the striking advantages of reinforced concrete construction—its great window area, giving a maximum of interior light.

Reinforced concrete factory of T. S. Simms Limited, Fairville, N.B., constructed by the Aberthaw Construction Co., Boston, Mass.



Concrete Factories are Most Efficient

The efficiency of a machine is the ratio of the amount of work a machine does to the amount of work required to operate it. The output is equal to the input minus the work lost or wasted. The less wasted the greater the efficiency.

In the same way the efficiency of a factory may be defined as the ratio of output to input. Output financially, is increased by reducing unnecessary expenses.

Concrete Stops Wastes

Concrete buildings are proof against fire, water and vermin. They give the maximum light and are sanitary. They resist vibration, and are permanent and durable.

Fire-proofness reduces insurance rates. Water or liquids used in certain processes will not leak through floors to destroy valuable goods below. Rats and other vermin find no place to live in a concrete building, thus eliminating losses from this cause. Maximum light and sanitary conditions increase efficiency of employees. Lack of vibration reduces wear and tear on machines. Permanency and durability reduce depreciation.

The way in which concrete stops these leaks is fully described in our handsomely illustrated 224 page book, "Factories and Warehouses of Concrete." It contains photographs and data of factories and warehouses for all classes of industries.

You can have a copy free if you will mention this advertisement.

Canada Cement Company
Limited
Montreal

You Can't Beat

THE

SMITH MIXER

It Holds The Record For

Quality of Material
Saving in Repairs
Large Output
Profit Making

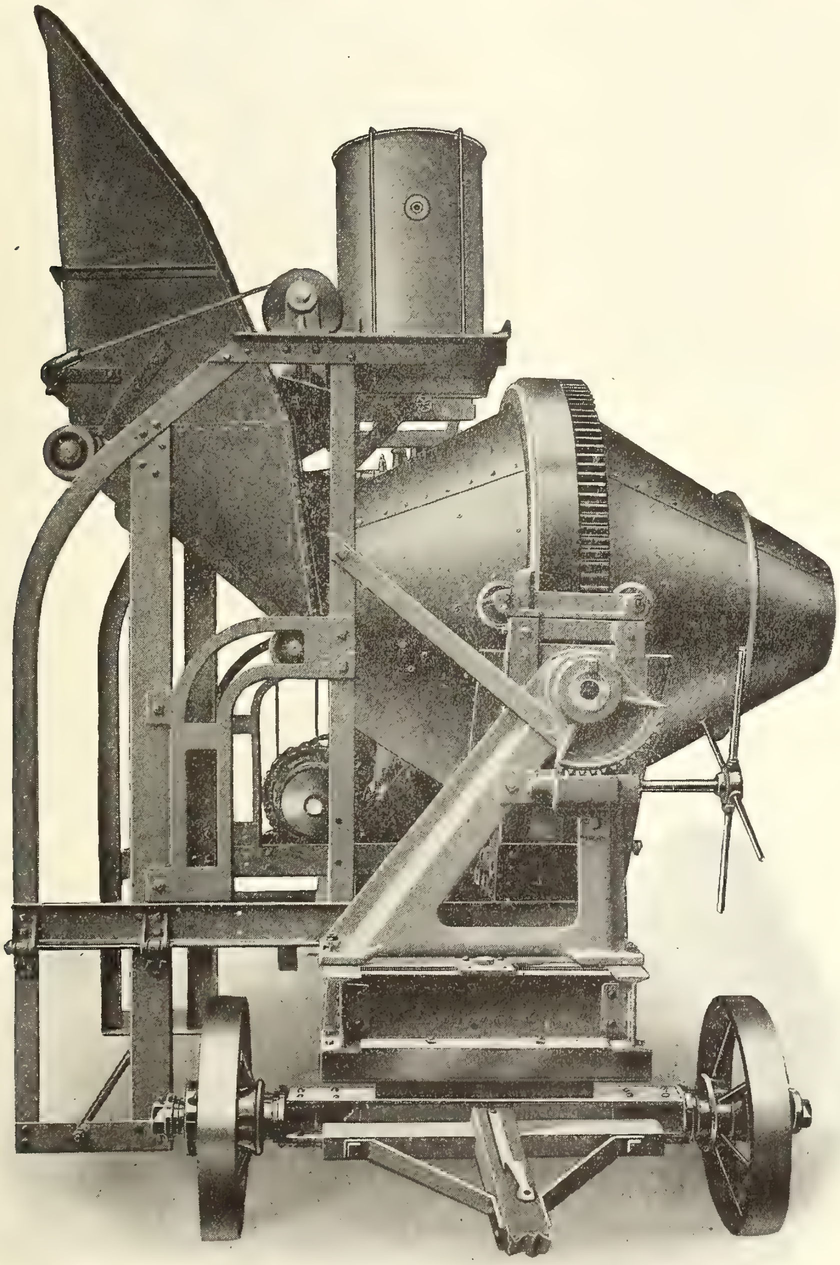
The SMITH is Beyond the Reach of All Competitors.

BUY YOUR SMITH NOW

Montreal, 318 St. James St.
Toronto, 155 West Richmond St.
Cobalt, opp. Right of Way Mine.
Winnipeg, 259-261 Stanley St.

MUSSENS

The Machine With A Reputation



The Smith Mixer Never Fails

LIMITED

Calgary, 10th Ave. & 3rd St. E.
Vancouver, 365 Water Street
Quebec, 71 Maple Ave.
St. John, N.B., 57 Smythe St.
Halifax, 78 Granville St.

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Improved Equipment Co.
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Kerr Engine Co.

(Continued on page 12)

Bank of Ottawa, Broadview and Gerrard, Toronto

Don Valley Clay Products are found in fine residences, handsome office buildings, imposing banks, stately public buildings and even the aristocratic little bungalow is often constructed of these excellent products.

Don Valley Bricks have the beauty of appearance that is so necessary a factor in present day construction.

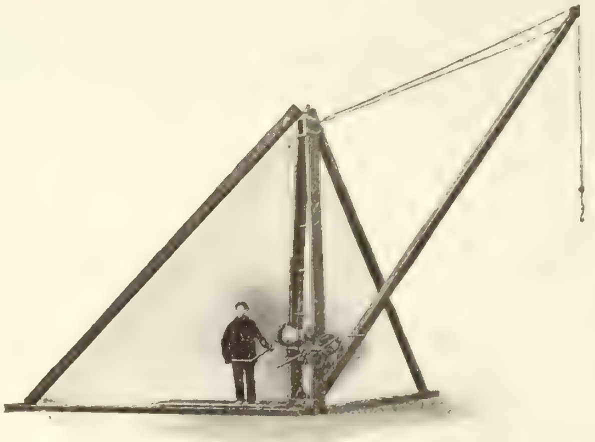
Specify "Don Valley Clay Products."

Don Valley Brick Works

Toronto, Ont.

Beath Scotch Derricks

Hand or Power



THE construction of Beath Scotch Derricks embodies several points of merit not found in other makes.

All stress parts are **steel** not cast iron. Bottom Pintle Bearing is of ball and socket type and works in a bath of oil, thus ensuring an easy movement at this joint.

Beath Derricks are provided with self-oiling bearings, ensuring easy operation and reducing wear to a minimum.

We also make Jinniwink Derricks, Stiff Leg Derricks, Guy Derricks, and Steel Derricks for heavy service. Hand or Power operated.

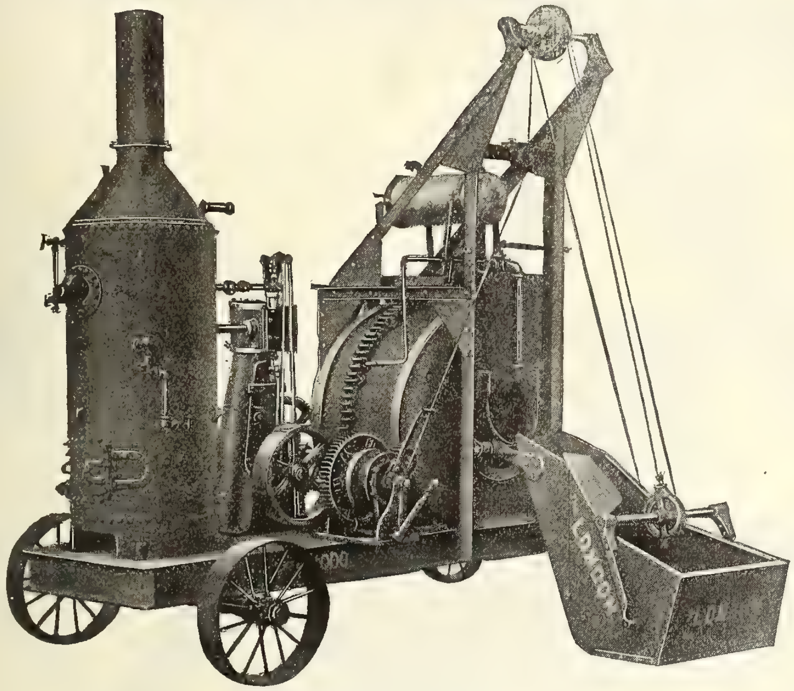
Send us your enquiries for Derricks

W. D. Beath & Son, Limited

ENGINEERS AND MANUFACTURERS

20-30 Cooper Ave., Toronto

CONCRETE MIXERS



Standard Drum Batch Mixer

Several Kinds, and built in sizes to suit all classes of work

The many improved features of the London Mixers have placed them in a class by themselves.

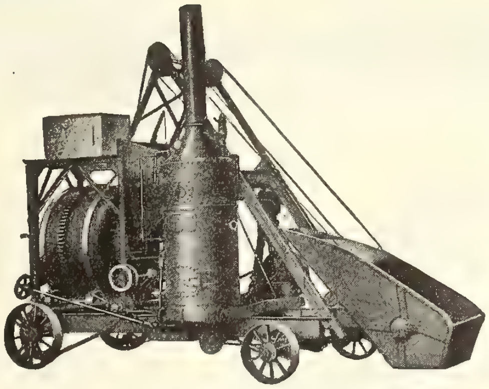
We can save the contractors money—

On First Cost
On Cost of Maintenance
On Cost of Operation

SEND FOR OUR CATALOGUE

We manufacture a full line of Concrete Machinery and Cement Working Tools.

Also a full line of Hoisting Engines and Contractors' Equipment.

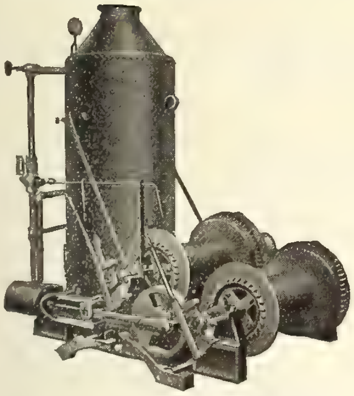


Rear Discharge Paving Machine with Forward Loader

Every machine made in our own factory.

Our machines are not made down to a price, but **made up to a standard.**

By manufacturing in a **large scale** we have been able to offer **high grade machines** at **remarkably low prices.**



Standard Hoisting Engine

We are the Largest Manufacturers of Concrete Machinery in Canada

No. 2 Automatic Batch Mixer

London Concrete Machinery Co., Limited

Head Office and Factory: Cabell St. and Kitchener Ave., London, Ont.

BRANCHES:

WINNIPEG (445 Main St.) W. H. Rosevear, Mgr. CALGARY (622 9th Ave. W.) P. D. McLaren, Mgr.
TORONTO (60 Richmond St. W.) F. D. Emsley, Mgr.

AGENCIES:

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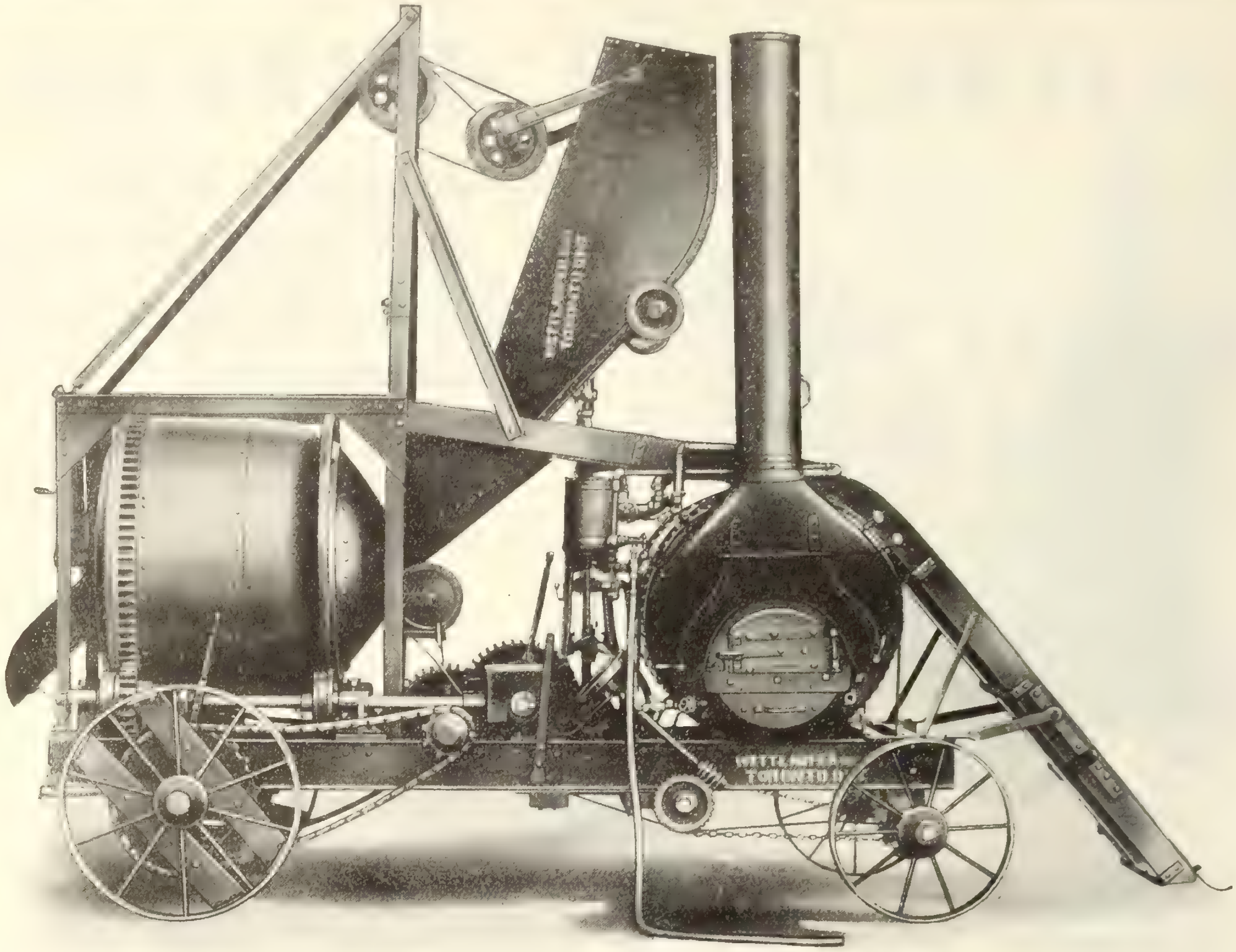
FORT WILLIAM, Northern Eng. & Supply Co. MONTREAL, Foss & Hill Mach. Co. QUEBEC, A. D. Masson



Daily Demonstrations

IN order that our prospective customers may have a thorough appreciation of the merits of Wettlaufer Mixers we hold daily demonstrations at all our branches.

Wettlaufer Mixers will stand the searchlight of microscopic examination and the more a man knows about a Wettlaufer Mixer the better will he be satisfied that it is without a superior.

Some features of the Wettlaufer Improved Stationary Heart Shape Drum Traction Mixer are;

¶ Horizontal Boiler—a saving in fuel. ¶ 2 Reduction of Gears—easy traction. ¶ A Unique Loading Skip—easy loading. ¶ Heart Shape Drum—thorough mixing. ¶ Load carried low—cannot be upset. ¶ Operated by one man in one position—a saving of money.

We welcome you to a demonstration. Write for catalogue.

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If you want crushed stone in a big hurry come to us and you will get it.

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Quarries located at Dundas and Vinemount.

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Our several cement mills are located at various points that enable us to make prompt shipments with short hauls.

Send us your next order.

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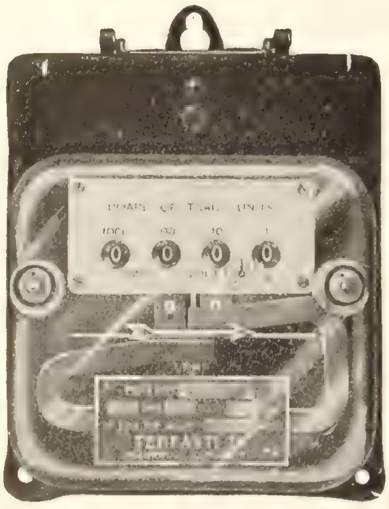

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A novel feature has been added to this wagon which places it beyond comparison with any other on the market, namely, **a steel channel filled with wood for the main side board**, giving unusual strength. This is the portion of the wagon that stands the heaviest strain, With this reinforced side board, breakage is practically impossible. It is short coupled and built low. Light in weight. **Write today.**

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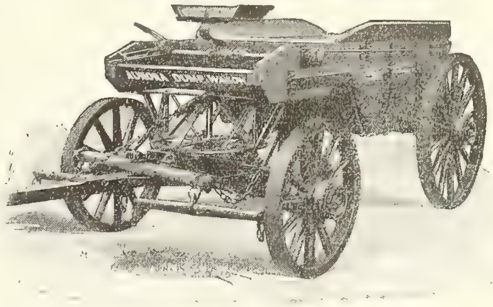

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The Toughest Stone for Macadam in Ontario

Record of Logan Avenue, Toronto, Macadamized from Queen St. to Gerrard St., in 1902

Length 2,454 Lin. Ft. Width 24 Lin. Ft. 6,550 Sq. Yds.

COST FOR REPAIRS	1903	$ 0.00	1908	$ 93.26
	1904	3.30	1909	200.46
	1905	9.35	1910	14.07
	1906	37.33	1911	2.29
	1907	16.11		

Total $376.17 or 5⅔c. per sq. yd. for repairs for nine years, a little over 6-10 of 1c. per sq. yd. per year.

Why Not Use Hagersville Stone and Get These Results?

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Hagersville, Ont. **Limited**

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Complete Outfits for Brickmakers

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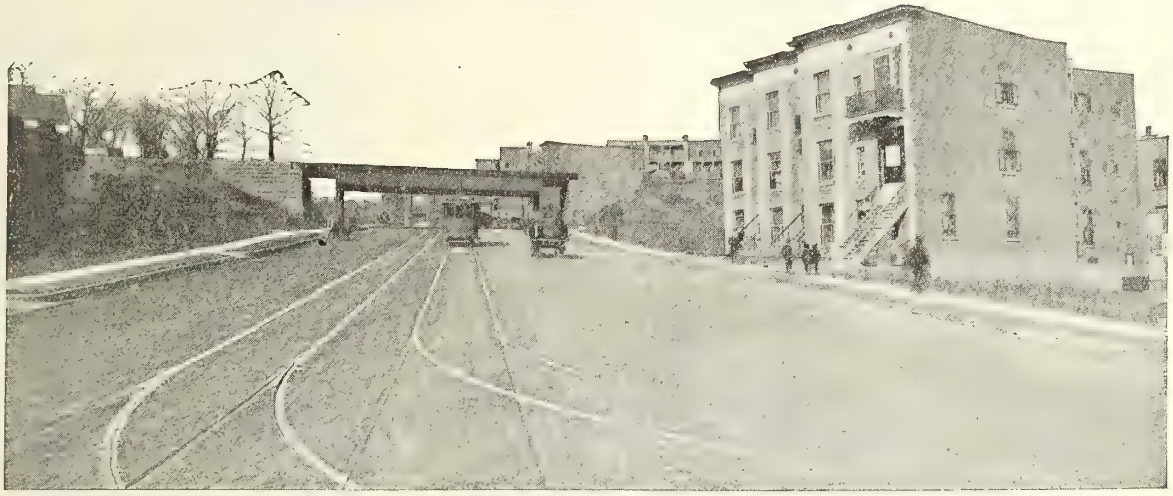
Preserves Roads
Prevents Dust



Atwater Avenue, Montreal, Quebec. Constructed with Tarvia Modern Pavement.

Tarvia vs. Plain Macadam

The right-hand side of the above roadway was built with "Tarvia X." The left-hand side is plain macadam. The tarviated side is adequate to cope with the traffic. The plain macadam side is in persistent disrepair.

In previous years this roadway washed and gullied very badly in the spring and many tons of macadam were dislodged from different parts of this hill and deposited at the bottom by the spring rains.

Now, after a rain, the tarviated side drains quickly and easily to the gutter. The plain macadam side gets muddy and stays so for some time.

The tarviated side gets more than its share of the traffic because it affords superior traction, yet it is free of dust except for what is blown upon it from its dusty neighbor on the other side of the tracks.

As to maintenance, the tarviated side needs no attention, while the plain macadam is in frequent need of care. The cost of upkeep in the long run will be considerably greater for the plain macadam, and the results will be very inferior.

The initial cost of the plain macadam may have been a little lower, but the high maintenance more than wipes out the saving.

"Tarvia X" which was used on half of this road is a dense, viscid coal tar product which is immune from damage by water and frost. It forms a dense, plastic matrix about the stone, prevents internal movements of the roadway, and by reason of its plasticity, develops a surface that grows smoother with traffic.

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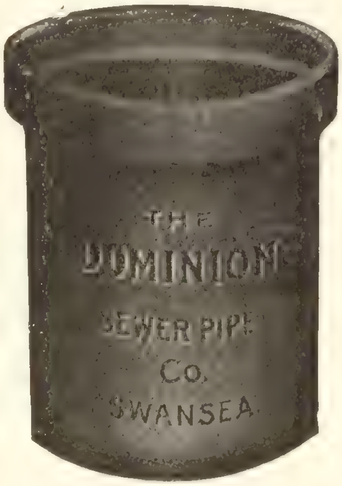

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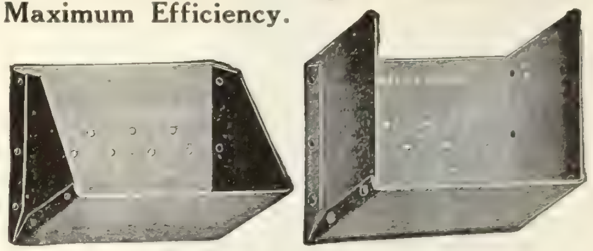

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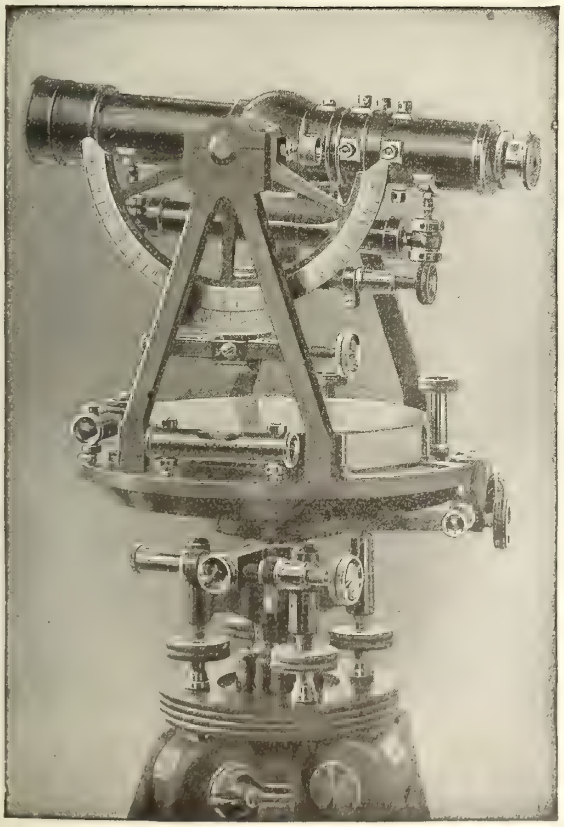

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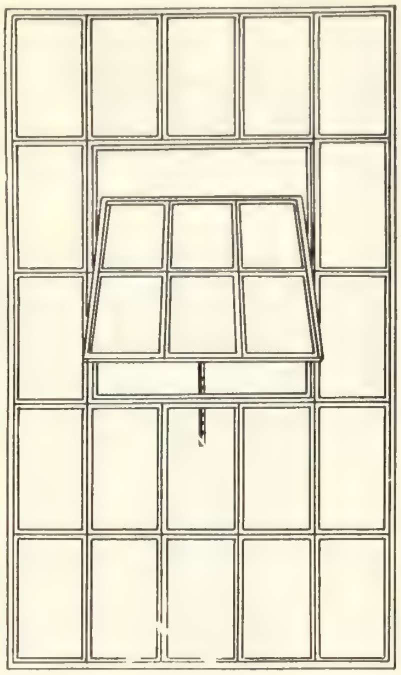

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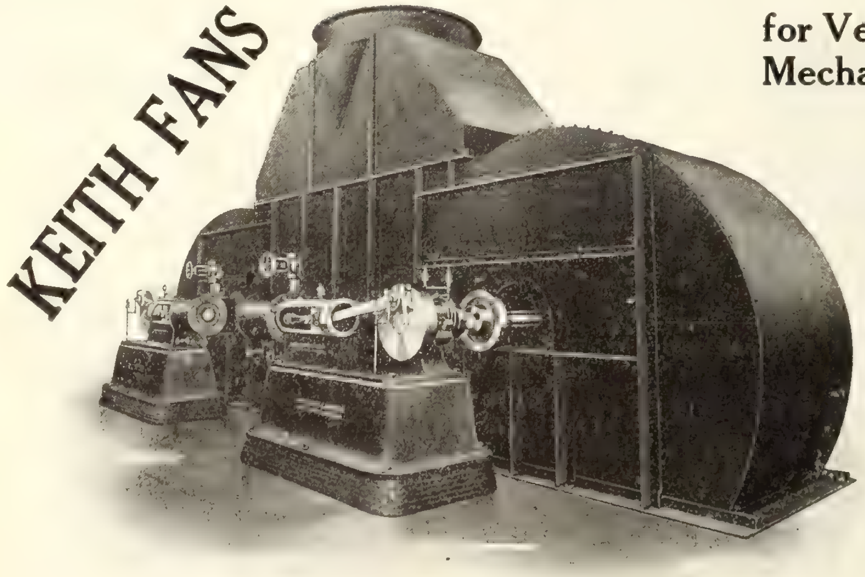

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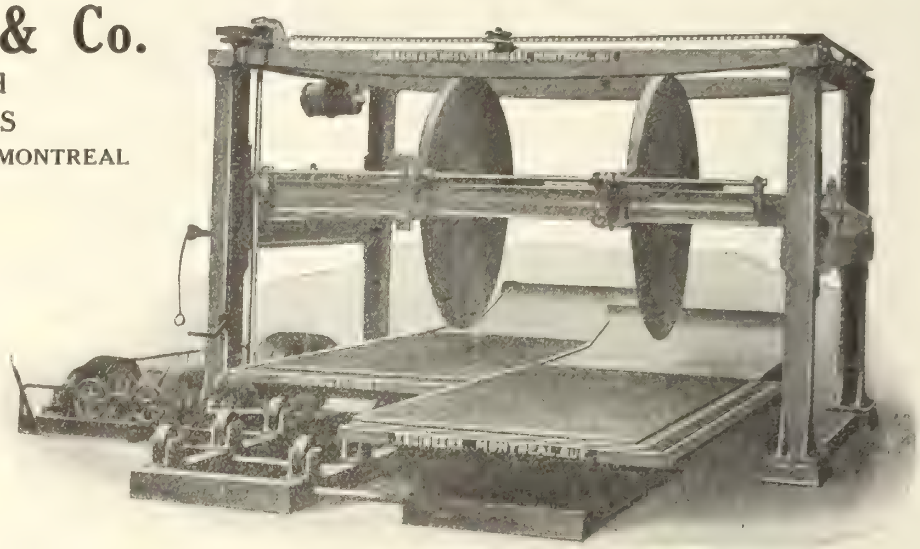

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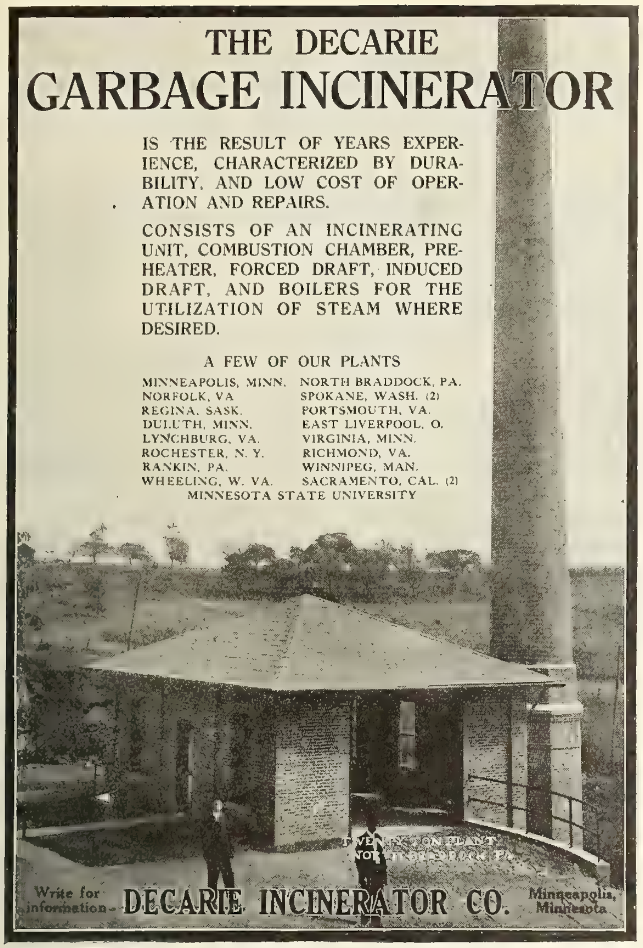

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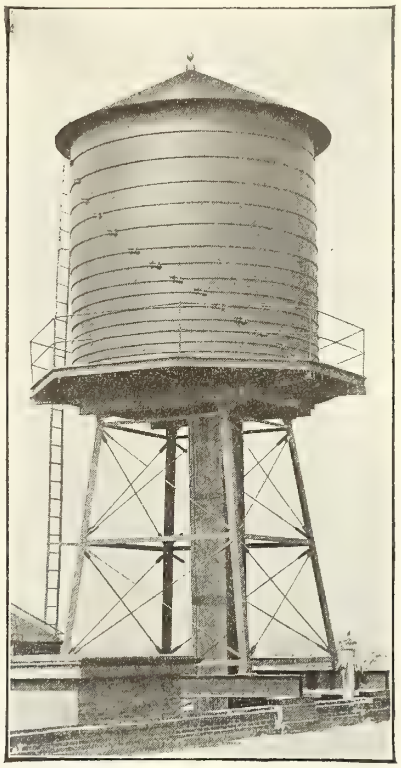

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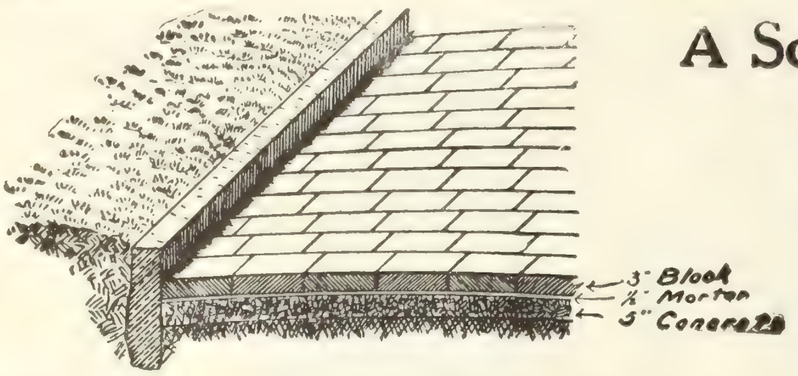

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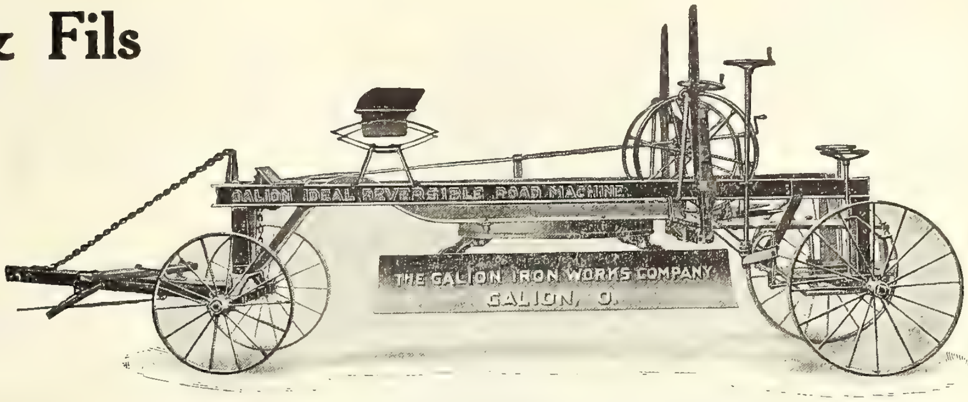
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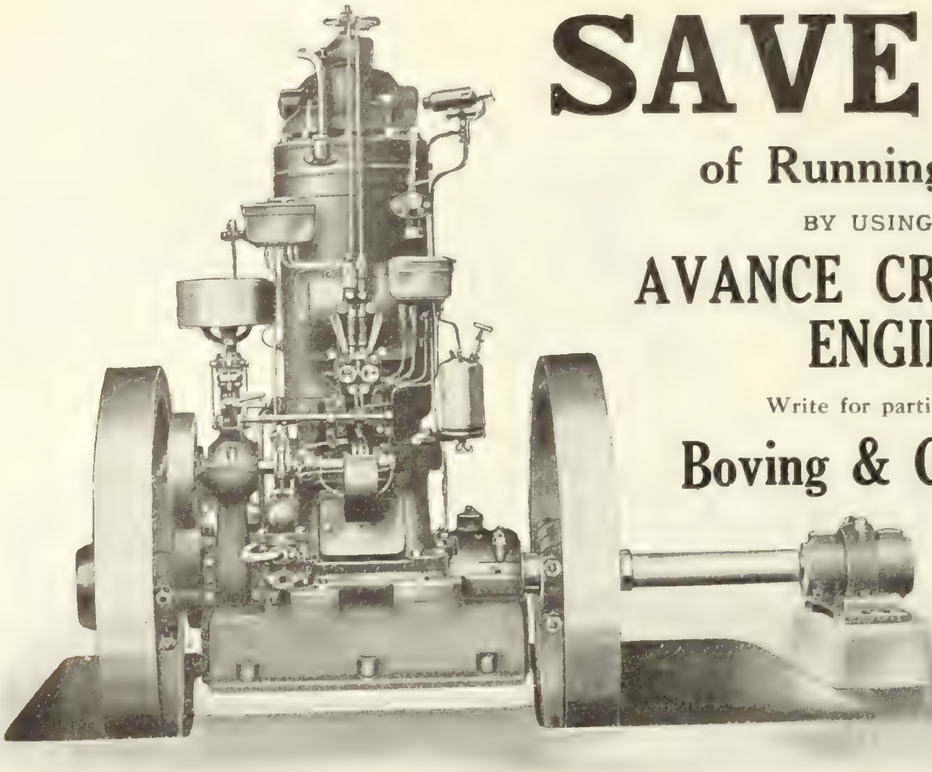

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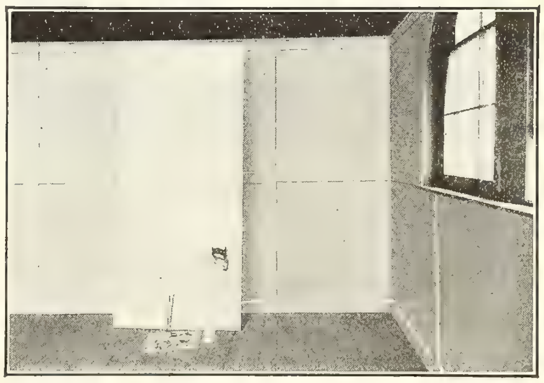
LINABESTOS Building Board



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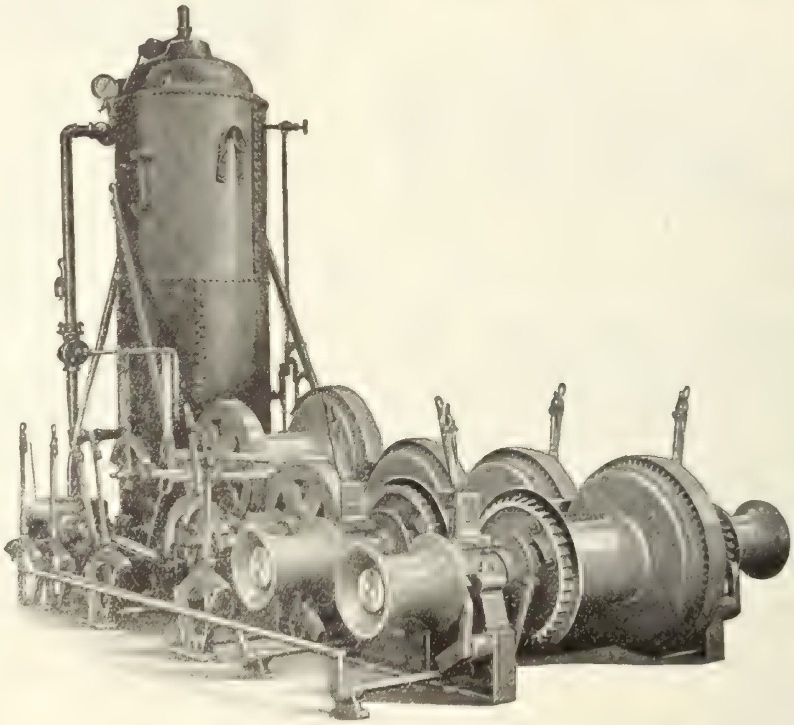

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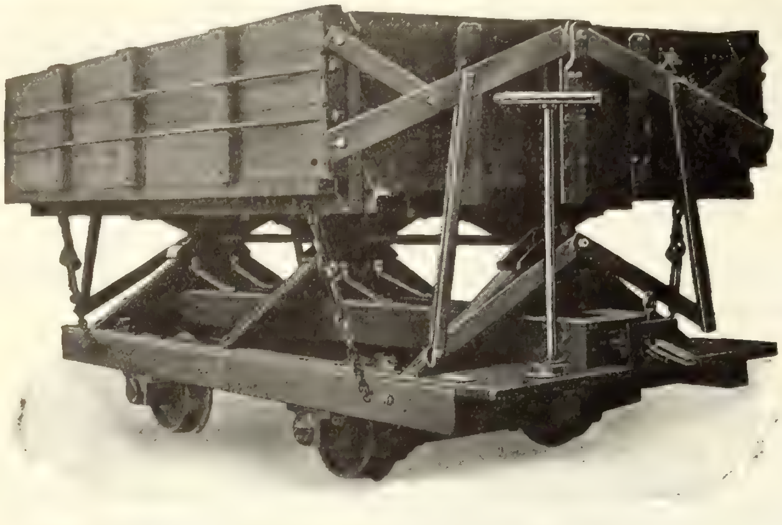

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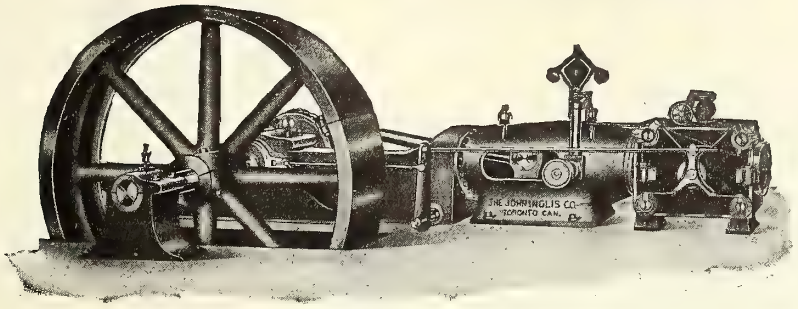

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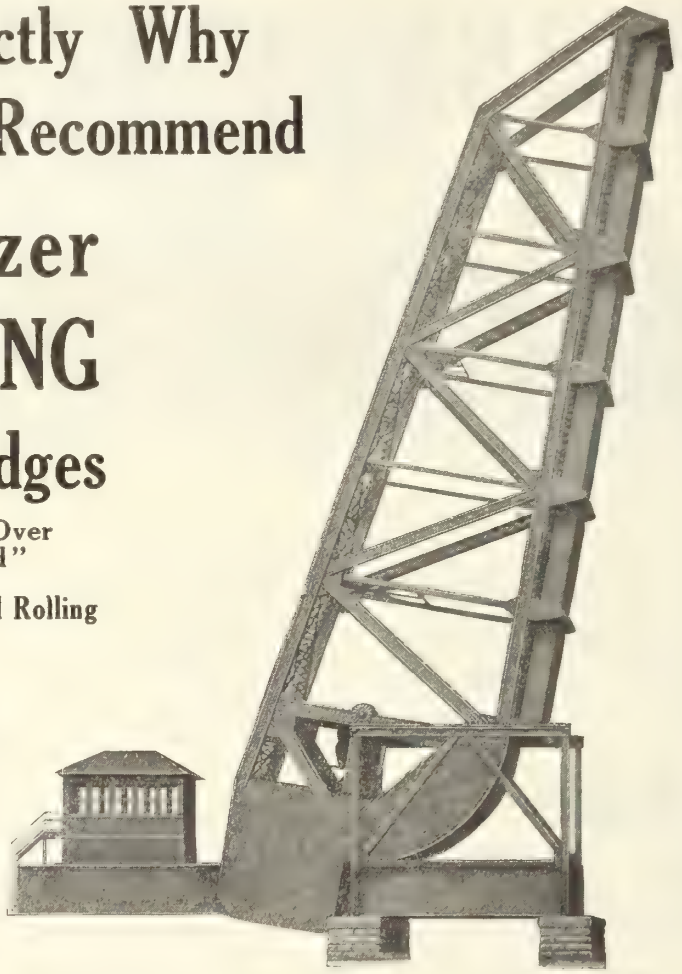

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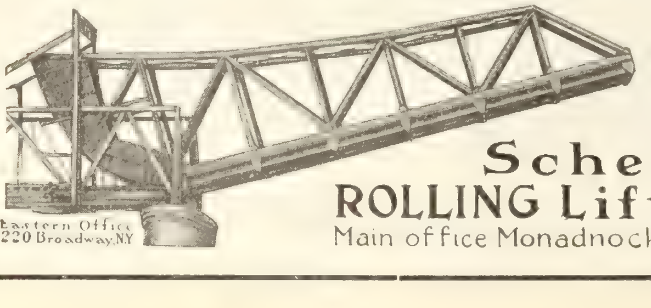

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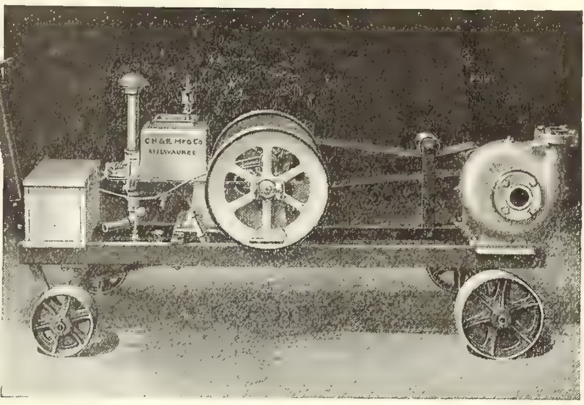

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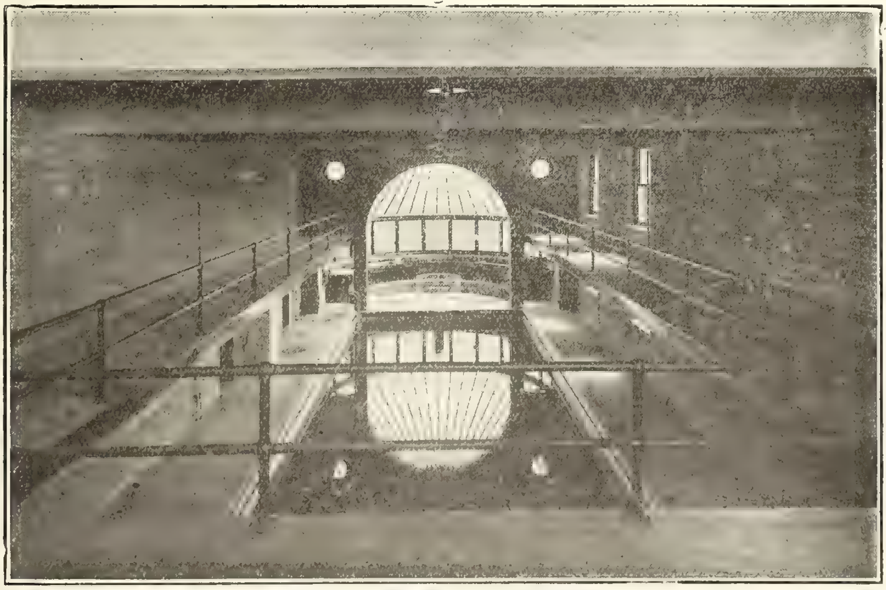

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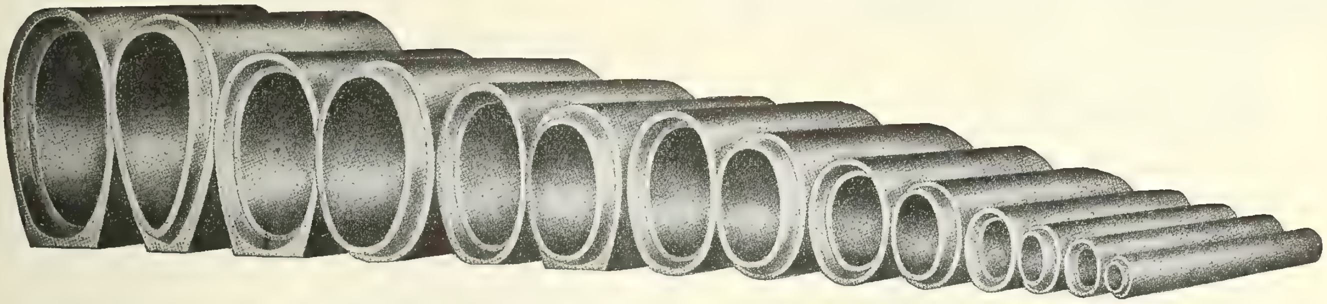

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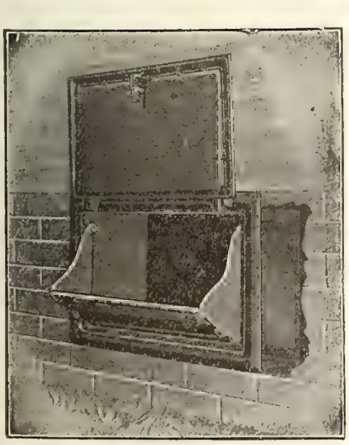

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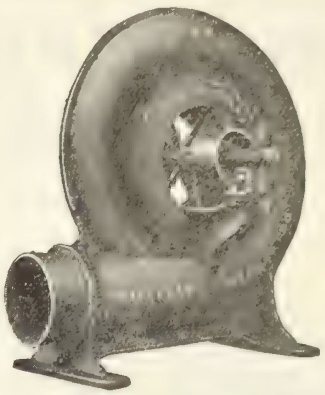

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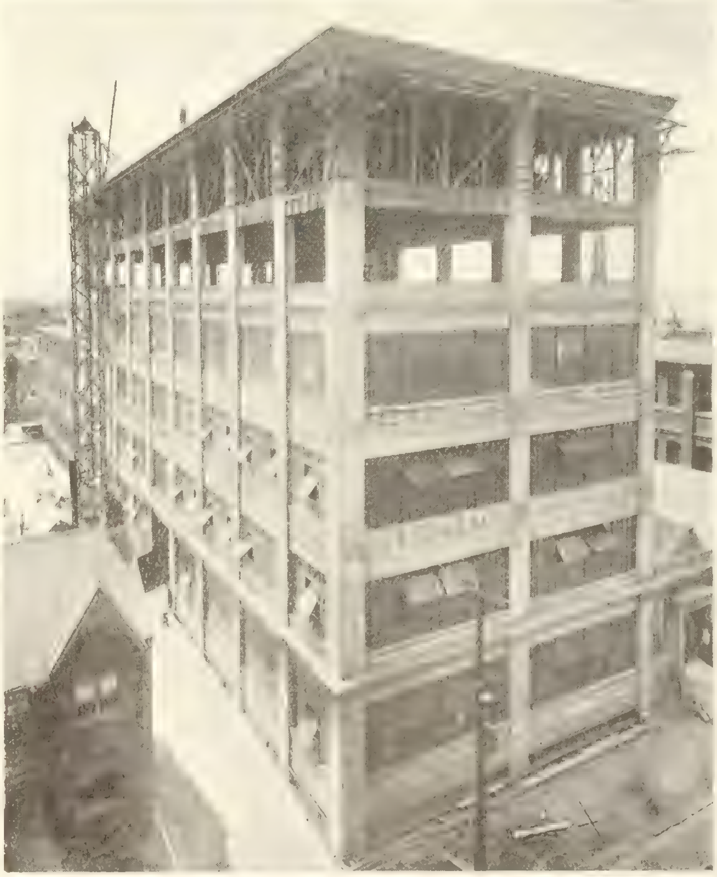

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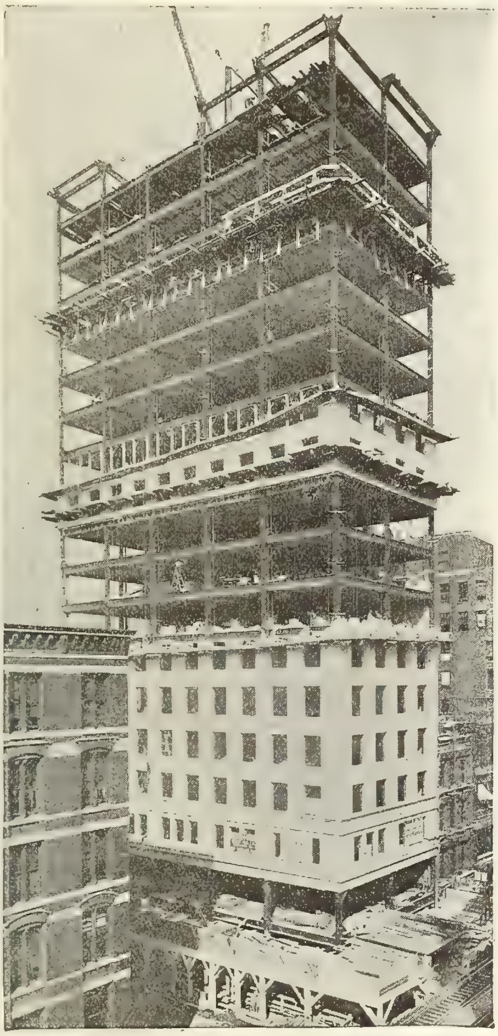

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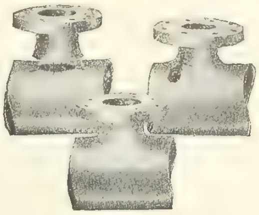

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ContractRecord
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Yours truly,
F. S. Baker
Architect.

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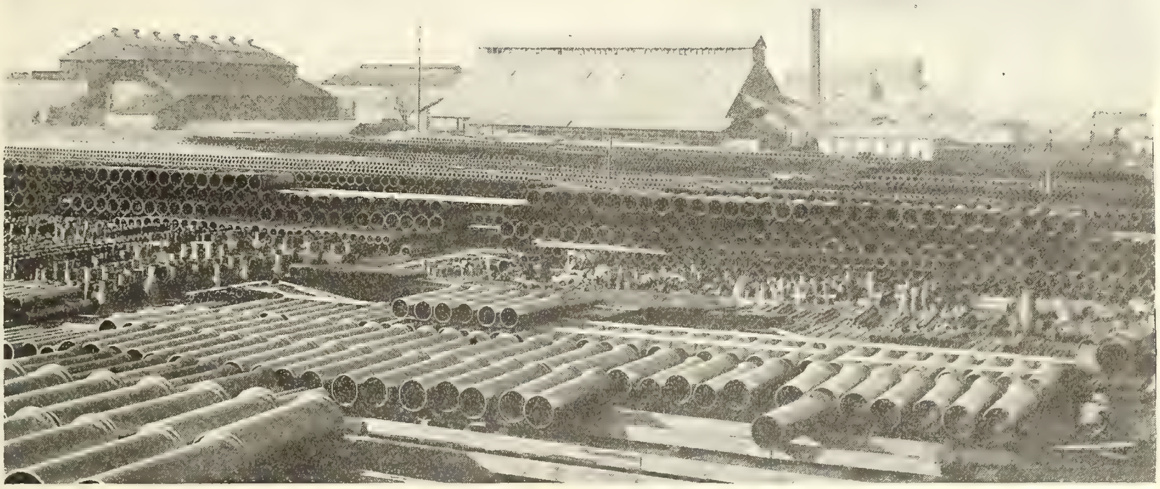

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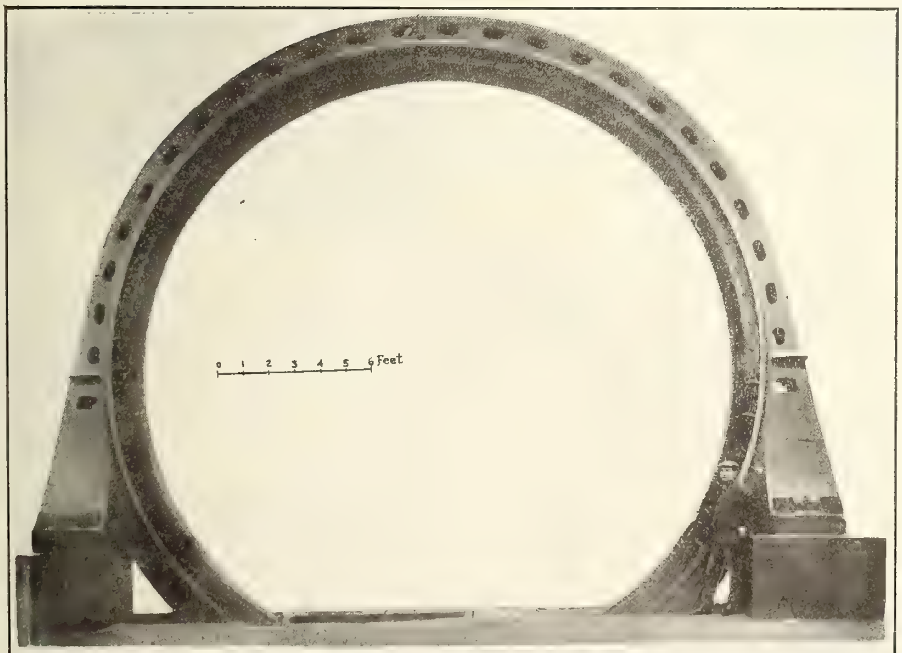

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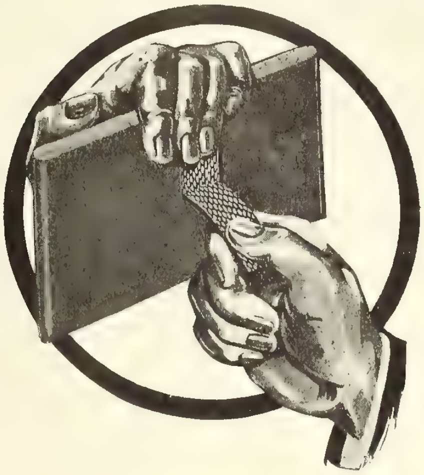
GOODYEAR



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GOODYEAR
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ESTABLISHED 1886

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Vol. 27 **July 23, 1913** **No. 30**

Advantages of Detailed Planning

THE phrase "Scientific Management" has become hackneyed in the descriptions of manufacturing processes and construction operations. Nevertheless the idea which it represents is finding fruition in many directions. One of these developments is the organization of a planning department in connection with large institutions. Two kinds of planning bureaus have been put into practice. The first is a large central department preparing the details for the whole institution. The second is a small central organization with a branch managing the detailed planning of each part of the works.

The work of this department is carried on by men whose experience has made them experts in this work. Those who plan aim to become acquainted with the details and state clearly the steps in the operation and to keep careful and accurate record of all costs to be used in making estimates and instituting comparisons.

The work of planning is generally carried on under three heads, namely, an investigation into the cost of labor applied directly to the material; an estimate of the value of the material and waste through inconvenient and unnecessary handling; a computation of the indirect labor used in the production of a given article. In direct labor the problem is to avoid wasting the time of skilled and high-priced mechanics. The loss is incurred through stoppages to decipher plans, to fetch material, or to sharpen tools. This loss is met by having the planners write out fully details of plans and unskilled labor fetch materials. In considering the question of material those in charge of the planning aim to use something that comes within the demands of the contract and yet is most readily workable. They also aim, where permissible, to have the product in a form that lends itself most readily to manipulation and arrangements are made to have as little handling as possible. A carefully prepared list of all usable second-hand material is constantly kept and is found to effect a great saving in repair work where it may be used as satisfactorily in many cases as a new article. The question of indirect labor is more difficult to deal with. By indirect labor is meant, supervision, depreciation, labor and material for cleaning shops and other items, general in character, yet a proportional part of whose cost should be located against each job in progress.

The planning department has worked efficiently in the manufacture of new material and has been particularly effective where repairing on a large scale is undertaken. Here the unusual character of the work frequently causes long delays and careful planning to a large extent makes it possible to avoid these delays.

Economical Engineering

TO-DAY most engineers would claim that their profession is reduced almost to an exact science, and that given certain conditions to meet, a relatively fixed quantity of material and labor are necessary to carry out a particular piece of work. At the same time a considerable amount of waste and inefficiency is apparent when the subject is investigated and we purpose to point out a few of these and give possible remedies.

Probably the most glaring waste relates to the preparation of estimates. Every enquiry sent out entails some amount of work, and in most cases the determination of quantities occupies the greatest time. If a design is asked for as well, the work is proportionately greater.

Very few enquiries are sent to one firm only, and each firm asked to quote will cover the same ground.

In quite a number of cases those requiring the service think they will escape the cost of professional advice by a consulting engineer. As a matter of fact they actually pay for the services given by the firms tendering on the work, perhaps not directly and probably not in a fair proportion every time.

It is, however, very evident that someone has to pay for the work done in preparing estimates, as this is one of the fixed charges on an industry, and probably from thirty to fifty per cent. of the salaries of the designing and estimating staffs are paid for the kind of work mentioned.

From a practical point of view the best consulting service should be given by a firm actually producing the article, and I should advocate, that all firms without a designing staff of their own for the particular work required should call in one of the firms from whom they propose to get a quotation, and pay them a reasonable figure for the work of designing and estimating quantities whether they give them the order or not.

This work, once done and approved, can then be submitted to as many other concerns as considered desirable. It should, however, be borne in mind that the figures and weights should be guaranteed, and not as some firms do at the present time, disclaim all responsibility for the accuracy of their work which naturally entails a check by the people quoting on the job.

Where your own organization is capable of dealing with the design and estimate of quantities follow the same course.

If you think somebody else will pay for your share of this present unnecessary expense don't lose sight of the fact that you may be paying for the other man's portion, and it may be really larger than your own. Estimates are not given free and never were given away for nothing.

One of the first things in this direction which could be readily changed, and I think with great advantage to all concerned are bridges, particularly highway bridges. The need for these is very great at the present time, and more than one economy might be effected.

Each particular province has some special requirements, and at the moment separate specifications. It would be comparatively easy to reconcile these various requirements into a few general types which would suit all conditions necessary.

In addition either a government or separate provincial departments with a properly equipped designing staff drafted from the manufacturers establishments capable of making fully detailed working drawings, bills of material, estimates of weights, etc., should be established. The work would thus be standardized and instead of making a series of bridges with only a few inches or feet difference in span, the abutments would be fixed to suit the standard bridges.

Some of the effects of this policy would be as follows:—

The elimination of about six designs and estimates for each new standard bridge.

The saving of the above work altogether on standard bridges used more than once.

The preparation of one set of working drawings, bills of material, weights, etc., for each standard bridge.

The uniformity in design, and the possibilities of stocking the exact material required, would facilitate deliveries.

Better opportunities for getting the most economical distribution of material.

The adoption of standard templates as a result of careful analysis and comparison.

That such a system run by a business government could be made a commercial success there is not the slightest doubt, and the saving effected would be enormous, both in labor and material.

Addition to Filtration Plant

COMMISSIONER Harris and Drs. Hastings and Nasmith, Toronto, have presented to the Committee of Works their report on the addition to the filtration plant now in operation at the Island. The report recommends the establishment of a mechanical filter in conjunction with the present slow sand filter at a cost of one million dollars.

The arguments upon which it is determined to establish a mechanical filter are cogent enough. During seasons of storm fine particles of sand are carried into the present filter and threaten to destroy its usefulness. A portion of the slow sand filter must always be out of use for cleaning purposes. During the winter it is practically impossible to clean the sand used in filtration and this must be taken out and stored for cleansing in the spring. A mechanical filter is more costly in operation but overcomes the difficulties mentioned in the sand filter. Owing to the amount of money—$800,000—already expended on the Island filter, Commissioner Harris and Drs. Hastings and Nasmith did not care to recommend the abandonment of that plant. However, they expressed doubts as to its permanency and some fears as to the result upon its efficiency, of the dredging and harbor work soon to be undertaken by the Harbor Commission.

The information they presented, however, was comprehensive enough to give the Board of Works grounds upon which to deal with the matter in an effective way. Since there is doubt as to the permanency of the Island plant and since, as it was pointed out, subsidiary plants will be needed in the eastern and western portions of the city, not a few wonder why the commissioners should risk a million dollars and the health of the citizens of Toronto. To many sound judgment would indicate that the money should be employed in the construction of one of these suggested plants at Garrison Common or at Scarboro Heights, where, at either of these points, permanency and efficiency could be secured.

Editorial Comment

NEW York city is spending large sums of money in order to facilitate rapid subway transit. The Public Service Commission reports that up to June 15th eighty-one million dollars were being expended on twenty-seven miles. As each tunnel contains four tracks it may be said that they have one hundred under construction. The work is being done by fourteen contracting firms, who give employment to about six thousand men daily.

* * *

THE report of the factory inspectors for the province of Ontario contains a number of interesting details. During the year the inspectors visited shops in which the aggregate of employees was 238,257. In making their visits the inspectors travelled a distance of 55,000 miles. The accidents for the year 1912 were 1,502, a seeming increase of 417 over the year 1911. This is probably only an apparent increase as the improved methods and greater strictness in enforcing the reporting of accidents is bringing to light many cases which were formerly unnoticed. The fatal accidents for the year totalled sixty-two. The inspectors find some little difficulty in maintaining the regulations with regard to protected machinery. The workmen themselves find the protective appliances in the road and discard them.

* * *

A GROUP of English and Canadian financiers, known as the Mexican Light & Power Company, has just completed at an enormous cost, one of the largest, if not the largest, power plants on this continent. The works are situated within ten miles of the city of Mexico and comprise two large power houses with four smaller plants. The total output is one hundred and fifty thousand h.p. The reservoirs are considered a remarkable engineering feat. They were built high up in the mountains and tunnels were bored through the intervening spaces in order to allow water to pass from one to the other. The largest has a capacity of six million cubic feet of water. The work occupied a period of ten years and at no time for the last three years has there been less than six thousand laborers employed.

The Quantity System of Estimating*

Loss Occasioned by Present Method—The New System — Cost Surveyors — Method of Work — Advantages

By Alexander Wright, Architect, M. A. I. A., San Francisco.

THE ever-increasing amount of unproductive time, and usually money, which contractors are called upon to expend in preparing, gratuitously, quantities, as well as prices, often for an owner's benefit, suggests that the time has arrived when all concerned should take up, and seriously consider, the possibility of adopting a modern and more sensible system of estimating, such, for example, as has been long in successful operation in older communities. Not a mere copying of such methods, for I advocate the creation of a standardized method of our own, practical above all things; a system that will be in line with our otherwise progressive building methods; a system that shall be clear and accurate, and that shall stand for square dealing between contractor and owner—in short, a system that shall give every man his due, no more and no less; a progressive system, free from the defects of other systems, such as unnecessary elaboration, and yet one that will reveal to the bidder, at a glance, the actual quantity of material and labor in a structure, in any individual trade. When bidders are invited to submit bids, they are theoretically asked of course to submit competitive prices, but in actual practice their bids are based upon competitive quantities, before the competition in prices commences; which, in my opinion, is as unjust to the contractor as it is ridiculous. A building can only contain a certain amount of material, and no amount of figuring by contractors against each other can make that quantity any more or any less. Where, then, is the sense in a dozen or more general contractors competing against each other in taking quantities? One or more bidders, through being hurried, or being unable to take off the quantities accurately, leaves something out. What happens? Their bids are consequently low, and the owner benefits, at the low bidder's expense, because his quantities are more accurate, or because there may have been room for uncertainty when figuring the plans and specifications.

Those of us who know something of the unsatisfactory conditions under which bidders are often obliged to figure, time after time without result, have realized that hundreds of thousands of dollars in time and money are taken from contractors' pockets every year, simply because they do not, so far, limit competition between themselves to the matter of prices. They go on competing, and I suggest gambling, with each other as to the quantity of material a building will take, whereas I contend that this is a question of fact, and that competition in the quantities between contractors never can, and never will, in any way, change the fact that a certain fixed quantity of material and labor is necessary to do every job. There can be no legitimate competition in taking off quantities of materials, except that unfortunate competition which bidders make themselves when they take off too much, or, as too often happens, too little.

Now let us consider, for a moment, a few of the disadvantages of existing methods:

First—The time usually given for figuring is far too short for the accurate taking off of quantities, in addition to the pricing and figuring out of the many items. A bidder usually has contract work in progress, and other matters to be attended to during the day time; other plans are to be figured by a certain time, and but little can be accomplished in the eight-hour working day, and so advantage must be taken of the night hours. Only those who have worked under these conditions and over blue prints at night, hour after hour, taking off items, can appreciate the many difficulties, pitfalls, and liability to error through figuring against time, after the real work of the business day is over. But the plans must be returned first thing in the morning, or the bid must be in by a certain hour the next day. Nothing but hurry—hurry—hurry. In not a few cases more information is necessary; something is not quite clear. The plans and specifications do not agree on some point. Which is right? There is no time to find out, the only person who can enlighten you is asleep, perhaps, while the careful estimator is burning the midnight oil, and wrestling with problems which can be avoided and entirely eliminated under a more modern system of estimating.

Again, the careful bidder who honestly tries to get in all the items, and figures to do the work as called for, is frequently beaten by a less competent bidder, who forgets something, or who, maybe, is willing to take a chance anyway, in order to get the job. True, omissions in lists of materials are sometimes unavoidable, under existing methods, which unfortunately aim at speed rather than accuracy.

It is, to say the least, disappointing to a careful bidder on a large job to find his bid just above the lowest, and after the low man has signed up the contract, it develops that the painting, or some such item, was left out. This, however, could not occur with the Quantity System.

A Bill of Quantities

Now we will investigate a bill of quantities, such as we are considering. What is it? and how is it used?

First of all, it is a document, handed free of expense to each bidder, lithographed or similarly duplicated, in order that all bidders' copies may be exactly alike. It will contain everything which it is essential for a contractor to know when making up a figure, with a separate section for each trade, such as excavation, concrete, brickwork, and so forth. A general summary is provided at the end of the bill, in which is entered the net cost of each trade; this summary is footed up, the profit the bidder expects to make is added, plus the cost of the quantities, the result being, of course, the amount of the bid.

The methods of measurement must conform to the standards used by each individual trade, and through the bill the greatest care is taken to have everything systematized; all cubic, square and lineal feet, and numbers of items, will be found all together under their respective heads. In this way, immediate reference may be made to any item required, even though the entire bill may contain hundreds of items, and so every item has its proper place—nothing is left to chance. Detail sketches also appear in the margin whenever necessary, to show a bidder at a glance what is required. These, as we know, are of more value to an estimator than the long written descriptions one sometimes finds in specifications. The key-note of the Quantity Surveyor is accuracy. In going through the drawings and specifications he has come across all those doubtful questions which always crop up when figuring under present methods. He will have taken them all up with the architect, and adjusted them, before the quantities are handed to bidders, so that everything is all plain sailing.

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* Abstract of an address to the General Contractors' Association of San Francisco, April, 1913.

Further, and right here, lies one of the greatest advantages of the Quantity System. It is not necessary, except in a general way, for a bidder to study the drawings and specifications at all, and he certainly does not have to figure them. He simply prices the bill of quantities, and, in these days of hurry and bustle, this is as much as a contractor can be expected to do for nothing. This enables the competent contractor (the one who has unit prices at his finger ends) to make up a bid for, say a $100,000 building, in a few hours, and he has the satisfaction of knowing, when the unit price is placed against each item, that nothing has been forgotten; in other words, he only contracts to furnish so much material and labor—and surely this is absolutely right in principle. Good reasons exist why the general contractor should have faith in his own judgment and accustom himself to price items in every trade which goes to make up the building business. It is the only consistent method of estimating, for anyone who claims to be a general contractor. Experience has taught most competent men that it pays to do it. The mere getting together of figures from subbidders, and footing up the totals of the lowest, is not estimating at all. That is mere schoolboy work. However, I am led to believe that this is now the exception among general contractors in San Francisco rather than the rule. The ideal contractor is the one who makes up his own estimates, and not he who is dependent, for any reason, upon sub-contractors, who thus become the real estimators. If every general contractor would keep a prime-cost book of all trades, and quantities were supplied to him, he would soon be in a position to give a fairly close figure upon any sized structure, without first taking sub-bids, and this I suggest is the most consistent, satisfactory, and profitable method to pursue, when bidding upon work as a whole; but of course it requires care and experience.

Further, one of the greatest arguments in favor of letting contracts as a whole is, of course, the fact that a general contractor has the ability to figure all trades in his own office, and that he knows how to, and will supervise the work of sub-contractors, if any. If architects can be assured of this being done, it would be better for all concerned.

In general practice I believe the accuracy of the bill of quantities should be guaranteed. Such a document might well be made the basis of the contract, equally with the drawings and specifications; if this were done, the chief cause of disputes between owner and contractor would be removed.

This, I submit, is entirely logical and right—a certain quantity of work for a certain sum of money, the owner to determine the former and the contractor to fix the latter. Surely this is morally just and fair.

Quantity Surveys

It may be asked, Where are these competent surveyors to be found? And it would be a natural inquiry, as it is no part of the duty of architects to prepare such quantities. In fact, the relation of the architect to the contractor should preclude him from having anything to do with furnishing quantities. This should be attended to by a disinterested specialist—the quantity surveyor. In older countries, young men of education are now apprenticed to practising surveyors, and it has become a recognized profession. Years ago these quantity surveyors frequently came from the ranks of the architects; others possessing the necessary education were possibly contractors, building superintendents or estimators. I have known contractors' representatives who commenced life in the workshop, who, after securing the advantages of special training, made experienced and very competent quantity surveyors. There must be a beginning to everything, and doubtless there are many men in this country who, after some little training in the technique of this work, should make reliable quantity surveyors. The principal qualifications are honesty of purpose and a knowledge of architecture and construction. The surveyor should be a neat draughtsman and have actual experience in conducting building operations. He should possess the ability to readily detect discrepancies or conditions which might give rise to misunderstandings during construction, and last but not least, the necessary mentality to act disinterestedly. He must do what is right in measuring, as between the contractor and the owner. The usual custom is for the architect to furnish the quantity surveyor with a set of drawings and a draft specification, and the latter then commences work in his own offices. During this period the architect and surveyor are in frequent consultation, to the end that all uncertanties are cleared up and adjusted upon the drawings and specifications. In short, no effort is spared to obtain perfect clearness and accuracy before bidders commence figuring.

Taking Off Quantities

Three distinct processes are involved, and each process calls for different operations.

First—"Taking off" and entering every item (or "dimension," as it is called) upon the dimension sheets. This is always done in exactly the same order, in every building; no dimension, however small, is omitted—no guess-work of any kind is permitted. The exact location in the building of every dimension taken is carefully noted, and every figure or note taken is carefully preserved for future reference.

It is impossible to illustrate here the work in detail involved in taking off each trade, but the following may serve to show the general idea: Let us follow a surveyor for a moment in taking off his dimensions for a few items of—we will say, common brick work. He always commences taking dimensions at the same point on each floor plan; every length of wall from one angle to the next is measured separately and the dimensions entered in "waste," as it is termed. We will assume that it takes, say, fourteen dimensions to go clear around a building—these fourteen dimensions and their locations are permanently recorded, footed up, and the total lineal feet is then placed immediately below this, and a line drawn across the column to separate it from the next item. The dimension is squared, i.e., the number of square feet these figures represent is figured out, and opposite to the total we find a description, thus, for example: 21-inch wall of standard common brick work laid up with lime, mortar and Portland cement, gauged three to one pointed with flat joints one side for whitewash and raked out the other side for cementing.

In good practice it might be best to give the number of square feet superficial of wall, and give the thickness. The same method is adopted with each storey, with its varying thicknesses of walls, every dimension being entered in precisely the same order, with its particular location noted.

Then we come to deduction of openings. Those with inside and outside reveals (as in the case of box-frame windows) are taken separately, door openings the same. Those of one size and one thickness of wall are "timesed," as we say, and entered in the dimension column, so: "Ddt. 9/3 feet 9 inches x 7 feet 13 inches outside wall, fifth floor."

Then should follow an item, "extra labor," to so many 8-inch common brick segment arches in, say, three half-brick row-locks to 4-foot 6-inch openings with 3-inch rise in 8-inch wall, include for cutting skewbacks, etc., and for wood-turning piece and setting and striking. In case richer mortar was specified for arches, it would be so stated, and the proportions.

When rough cutting to brick work is required, every square foot of it would be measured. Brick work in footings or foundations, or walls below ground or at unusual heights, should be all segregated and given separately, with full descriptions.

Such items as the following are then taken by the square yard or square foot—viz., selected common brick facing. If joints are struck and cut (as face work), it is taken as a separate item, as should be the case with any portions that are to be pointed with special or colored mortar. Cementing by the square yard if on ordinary plain surfaces, but if in widths of 12 inches or under, then this is separated and taken by lineal foot; should this work occur on circular surfaces, it would be so described, kept separate, and the radius given. Lineal dimensions are taken of all rough splays and chambers, flues, pointing to flashings, projecting courses, with the number of mitres, splays, or stops in same; brick sills, with the returns, are numbered, if any. The labor of forming quoins, square or splayed, and (in certain cases) the lineal feet of plumbing angles and reveals, might be taken, also leveling up for joists, bond iron and the like.

The foregoing applies to common brick work, as before stated, Now, where face brick are used, the entire surface of such facing is measured by the square foot, including reveals and soffits (but openings deducted), the kind of mortar and the labor of pointing being given. Here would be taken such items as face arches. Fair cutting by the square foot on the same principle as mentioned for common brick work. Then come lineal feet of each course, of which figured sketches should appear. Raking mouldings or belts separate; then follow the number of external, internal, raking, skew or other mitres; also square ends, etc. (if any). All other lineal feet items follow, in their proper order, and then in a similar way, concluding with numbered items, which would be described and (if necessary) sketched in the margin. I am aware that this is but a very elementary illustration of the detailed method of taking off, but the principle applies throughout every department, in every trade, from the excavator to the painter, but it would be too great an undertaking to go fully into details here in each case.

Surveyors' quantities are usually measured net, and it is so stated in the preamble of the bill—upon the understanding that the unit price for each item is to be made, by the contractor, to cover trade customs, etc., which differ in each locality.

The before-mentioned dimension sheets are usually checked over with the drawings by a second person, and then all totals are abstracted; that is to say, they are transferred to abstract sheets, under separate headings. In this way many similar items of the same value are collected together and footed up and checked. This reduces the number of items which appear eventually in the finished bill, which is written direct from those abstract sheets, and any further sketches or descriptions necessary for the bidder to thoroughly understand what is required are then finally added. When completed, a sufficient number of copies of these bills are lithographed, or otherwise duplicated, and a copy is sent by the surveyor to the list of prospective bidders, whose names and addresses have been previously furnished him by the architect.

Advantages of Quantity System

Some of the advantages of the Quantity System of estimating to the contractor are as follows:

1. Saving of time and money.
2. Greater precision in measuring.
3. No uncertainty as to interpretation of plans or specifications (the quantities should govern).
4. No visits to the architect's office when figuring, for explanations or otherwise.
5. No other work is contracted for except the quantity set forth in the quantities.
6. The contractor, if he so desires, can check up the quantities before signing a contract. The quantities should, I think, form part of the contract.
7. No bidder can inadvertently leave out anything, and so in this way arrive at too low a figure.
8. Not having to spend time taking out his quantities, the contractor has time to attend to more profitable business.
9. Systematically arranged bills of quantities duly priced (whether work has been secured or not) form excellent data for making future estimates.

Two driven wells in Immigration Canyon have been sunk to augment the water supply of Salt Lake City, Utah, where the maximum consumption in summer runs to 34 to 40 million gallons daily, an amount equivalent to 400 gal. per capita. The average consumption is about one-half the maximum. Last winter during a severe cold spell an attempt was made to run the consumption beyond this amount, but the water was not available. About 1800 services were frozen and four thawing machines were kept busy night and day. To prevent a recurrence of this experience the water department is putting down six wells at a narrow point in Immigration Canyon and hopes to develop 3,000,000 to 5,000,000 gal. daily.

An electrically propelled motor dust cart, shown in the illustration, has been placed on the markets by a German manufacturer. The body is end dumping, the control being by means of a lever at the driver's seat. The body is so balanced that tipping is easy. According to German practice, one man only goes with the vehicle, attending to both loading and unloading. The single wheel in front makes it possible to drive the car about on crowded streets. The car may also be used as a sand distributor, a small motor operating a distributing device. The wagon body can be removed and its place taken by a seat. Power is supplied by an electric battery, which will carry it about 50 miles.

Construction of the Kamloops Reservoir

By N. M. Hall, Resident-Engineer

As a result of a movement on the part of the Kamloops City Council to enlarge and improve the municipal waterworks system and adapt it to the needs of the rapidly increasing population, the east half of lot 24, in the Beckman addition was obtained as a site for a new reservoir of one and a half million gallons capacity.

Until the present year the city had been using a concrete reservoir designed to hold 150,000 gallons, but this capacity had been greatly reduced by a flaw in the wall and it was far from adequate to handle the overflow at times of small demand, or supplement the pumps at periods when much water is consumed. During the irrigation season as much as 350 gallons per head is used, which on a basis of a population of 5,000 people amounts to 1,750,000 gallons per day.

In order to meet the increasing demands of the district the city council commissioned their engineers to design and supervise the erection of a new reservoir, with the result that about March 15th, 1912, the contract was let and construction commenced soon after. The location of the new reservoir is south of the eastern portion of the city, and lies between 8th and 9th Avenues, at an elevation giving a maximum of 300 ft. stake head over the city. The 14 in. steel main running up 9th Avenue connects westward with the old power station through the city distribution system, and eastward through a 14 in. and 16 in. main with the new power and pumping station, now being installed in the eastern part of the city. This pipe was supplied by the National Tube Company of Pittsburgh, through Crane Company, their Vancouver representatives. It is lap welded with Matheson joints and in addition to the regular coating has an extra wrapping of burlap as a protection against the strong alkaline reaction of the soil in the Thompson River Valley at Kamloops.

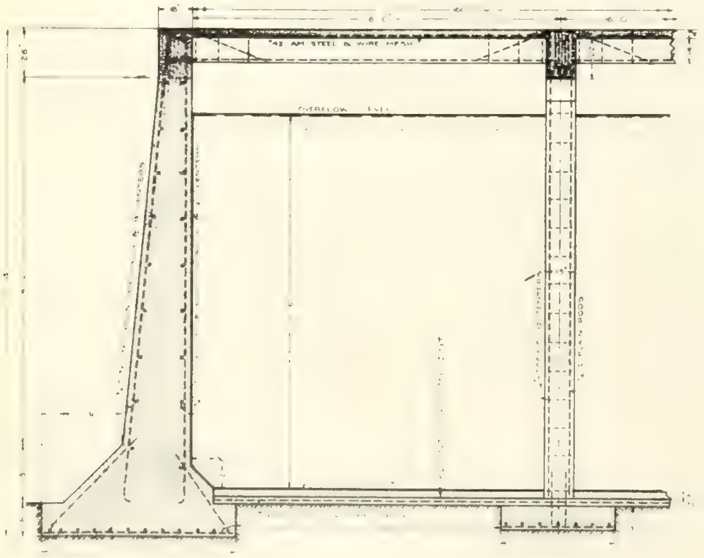

Fig. 1—Longitudinal section through main wall.

Only one pipe connects with the reservoir and the water flows in or out depending on whether the demand is less or greater than the supply of the pumps. The site is on a gentle slope and the whole so submerged that the excavation just counterbalanced the top covering of 18 in. deep and the back filling and grading of the adjacent ground. The excavation was somewhat in excess of 8,500 cubic yards and consisted of volcanic ash with traces of gravel and sand. It provided an ideal foundation for the structure.

Design Selected

The design decided upon was a totally enclosed reinforced concrete tank, with interior dimensions 160 x 96 feet, and a depth of water of 15 ft. 6 in. at the eastern end. The roof consisted of a 4 in. slab resting on a beamwork supported on square columns 16 ft. centres each way. The floor had a slope eastward of one foot in its length, and as the columns were all the same length the roof had a similar grade. The closed and backfilled type was chosen on account of the extremes of temperature and frequency of dust storms. Four tall galvanized iron ventilators and slits under the eaves of the gatehouse allow ample ventilation. The three main walls are shown in section in Fig. 1, and the fourth wall in Fig. 2. This latter will serve as the intermediate wall when the reservoir is extended southward to double the capacity, for which every provision has been made. The main walls are 18 in. at the top and 3 ft. at the bottom, not including the bevelling. The footing is a slab 18 in. thick and 8 ft. 6 in. wide. The intermediate wall is 24 in. at the top and 4 ft. at the bottom and stands symmetrically on a slab 18 in. x 10 ft. wide. The reinforcement in all walls consists of ¾ in. square twisted rods, 9 in. centre to centre, and 2 in. from each face. The horizontal rods are the same size and at 24 in. centres in each face. Additional short rods in the bevels extend into the footings lapping the verticals, and are securely tied to them. The footings of all walls have ½ in. square twisted rods placed to form 9 in. squares.

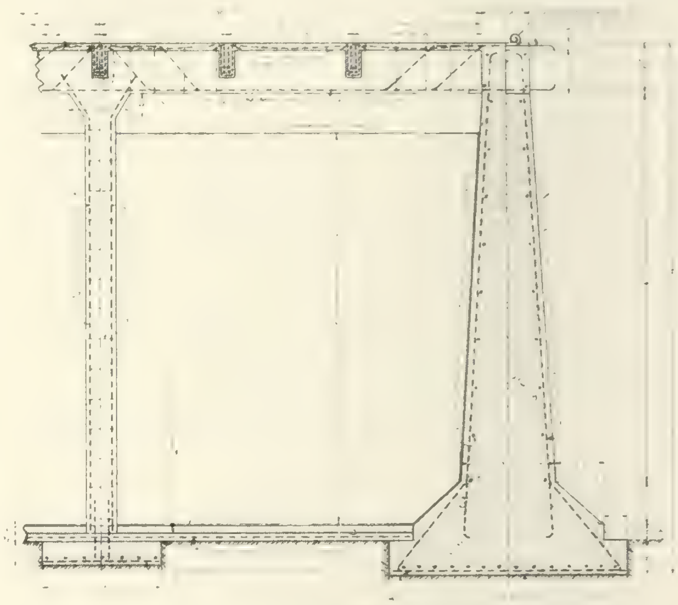

Fig. 2—Section through intermediate wall.

The columns are 15 in. square with 4 ¾ in. plain square rods with ¼ in. hooping at 12 in. centres. These rest on footings 12 in. thick and 4 ft. 6 in. square, reinforced, as are the wall footings.

The main girders span the roof merging at the columns with 9 in. x 12 in. haunches. They are 15 in.

wide and 26 in. deep being reinforced with 7 rods, ¾ in. square twisted, of which four bend up as shown in Fig. 2. The five stirrups at each end are ½ in. square steel.

The beams at 5 ft. 4 in. centres span between the girders and are 8 in. wide and 14 in. deep with 4 rods ¾ in. square twisted, of which two turn up, as shown in Fig. 1. They are of ⅜ in. steel square twisted.

The roof consists of a 4 in. slab reinforced with No. 42 mesh made by the American Steel and Wire Company. This provides .151 sq. ins. per foot width and will carry 275 to 300 lbs. per square foot. The floor was laid in two distinct layers. The first floor poured before any forms were erected, was 4½ ins. thick and poured directly on the ground lapping the steps allowed on the wall footings, and covering the wall footings through which dowel rods projected for connection with the column steel. This floor had embedded in it No. 26 mesh. After all forms had been removed the final layer, 4 in. thick of selected materials, was put on without any particular bond with the first floor beyond carefully washing it down. No mesh was laid in the final layer and ⅜ in. x ¼ in "V"-joints were left about 10 feet from the walls at the end of each days work. This floor and the wetted area of all walls, which was purposely left rough, was given a plastered coat of 1:1½ well trowelled in, on which was put a glazed finish of neat cement and water. The "V" joints were then poured with hot asphalt.

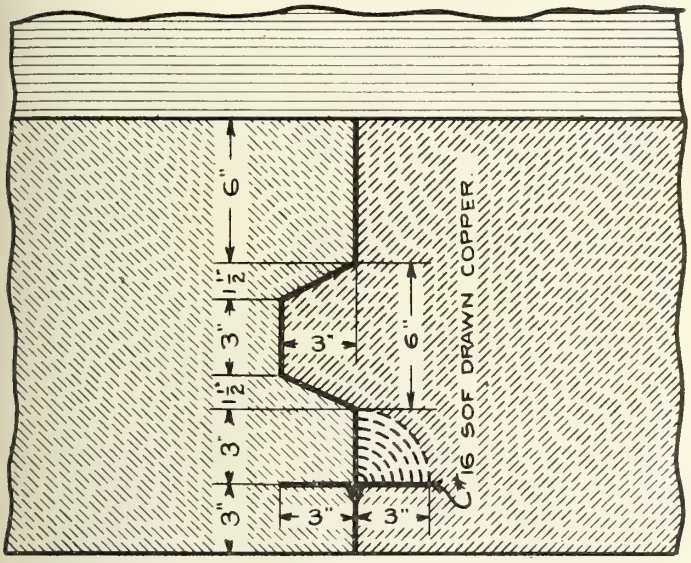

Fig. 3—Expansion joints in walls.

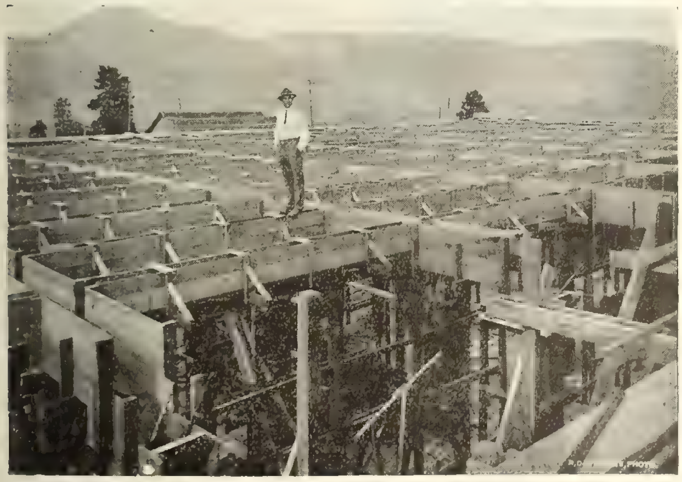

Fig. 5—Top runways for pouring the walls.

Expansion joints, as shown in Fig. 3, divide the walls vertically into sections about 32 feet long. These were formed by allowing no special bond between sections, apart from a dovetail and a 6-inch No. 16 gauge copper strip with a ½ in. "V" notch across the joint. The details and method of locating in the forms are shown in Fig. 3.

The Gate Well

The Gate Well shown in Fig. 4 is 13 ft. x 8 ft. with 12 in. walls with vertical ½ in. square twisted rods centrally located, 18 in. centre to centre and horizontal ¾ in. rods at spacing varying from 9 in. at the bottom to 15 in. at the top. These were located in the inner face to resist the earth pressure. This well contains the operating valves on the inlet pipe and the slush-out drain and overflow. The gate house (Fig. 4) covers the well and extends over the roof sufficiently to enclose the main manhole containing the only ladder descending into the reservoir. The walls are 6 in. thick with ½ in. rods 12 in. each way. The roof is a 3 in. slab with No. 42 mesh. There is a standard door and two stationary windows having heavy wire insertion glass in galvanized iron frames. As stated above slits under the eaves provide ventilation.

The 14 in. flanged cast iron inlet pipe passes through the gate well into the reservoir 18 in. above the floor and extends about three-quarters the length, terminating in an elbow and 12-foot vertical length. A check valve just inside the reservoir permits the water to run out but forces incoming water to enter by the upright length thus providing circulation and preventing stagnation. Within the well is the 14 in. controlling gate valve and a long radius wye for connection with the future extension. The 14 in. overflow and depressed drain with control gate lead into a common pipe to the sewer, provision having been made here also for conecting the future reservoirs. The

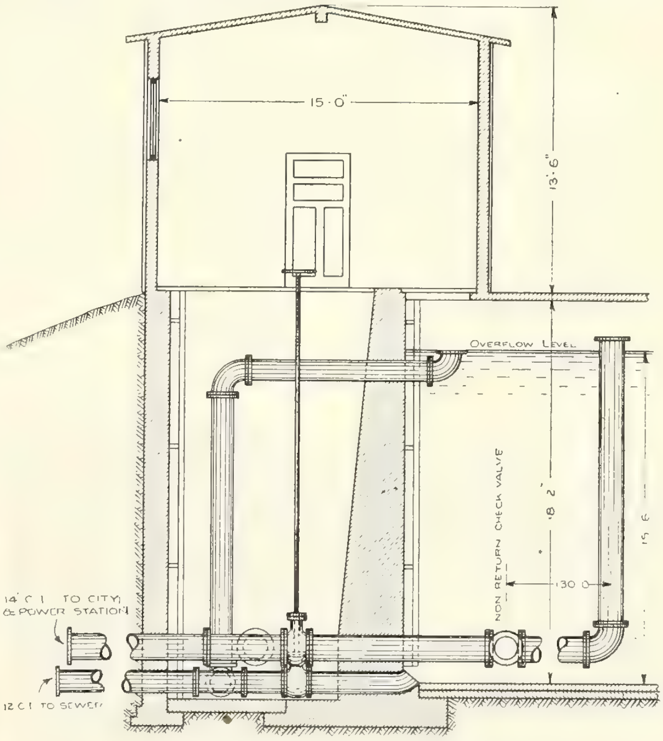

Fig. 4—Section through gate house.

main walls were designed as simple retaining walls to withstand the earth and water separately. In the worst case the resultant fell 8 in. beyond the middle third and the effect of the roof was considered sufficient to restore the resultant within that area. The intermediate wall was thickened due to the reversing stresses when acting as a dividing wall and to have sufficient width at the top for extension of roof and girders.

A second manhole with raised coping and cast iron cover was put in to assist in cleaning out. All reinforcement was lapped at least thirty diameters to form the splice. Concrete 1:2½:5 mix was used in the rough floor and all footings, and 1:2:4 mix elsewhere excepting the plaster coat of 1:1½. Various brands of cement were used owing to the shortage of the market, the principal brand being that of the Canada Cement Company of Exshaw, Alta. The sand and gravel were obtained from a hill a short distance away and were brought down in a chute 160 feet long, screened en route and run into the respective bunkers of 15 and 35 yards capacity. These were arranged for dumping into waggons driven underneath. The dry system was first employed, but owing to the continual damp weather this was replaced by the wet system, the sluicing water being pumped to the upper platform to which the material was brought by slip scrapers. After washing, the aggregate was first quality being hard, gritty and well graded.

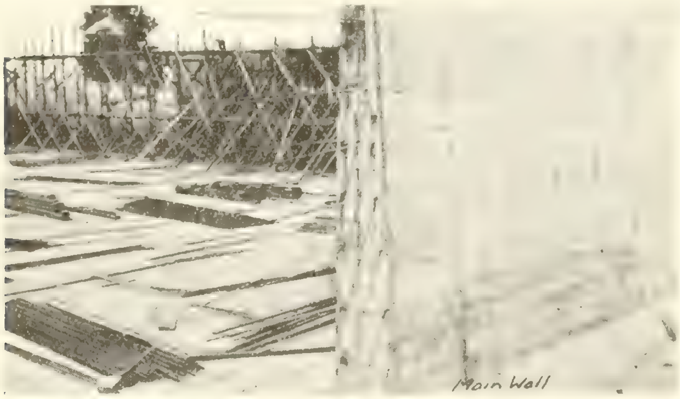

Fig. 6—Bulkheads and horizontal ¾" square twisted rods, 24" centre to centre.

Work of Construction

The lump sum contract was let about March 15th, 1912, and construction commenced soon after.

The excavation after loosening with a plow was easily removed by a slip scraper. About a month was so occupied and in the meantime the office, cement shed and chutes were erected and the mixer set up. The footings and rough floor were now trimmed up and the concrete poured without forms, and the rods in the bevels and also the dowels located. The wisdom of pouring the floor at this stage was soon apparent as it furnished a first-class area for workmen and also for storing material. The wall footings were surrounded by a line of 4 in. jointed tile laid in a bed of stone sprawls with joints covered with burlap. The wall forms in removable vertical sections in full height and 4 ft. wide were now erected and the bulkheads with dovetails and copper strips, as shown in Fig. 3, located in order to allow pouring in sections 32 feet long. The walls were poured partly from an intermediate staging and completed from the top runways as shown in the accompanying views. A wet mix requiring little or no tamping was used and rigid bracing prevented bulging or distortion of the forms. The top of the walls was coped and the rods arranged to provide a maximum bond for the roof slab and beam work. The gate well was poured in one operation. All piping and ladders were located in the forms and care taken to clean the former and pack the concrete around it. The column and roof structure forms and steel were now put in place. The columns were poured several days ahead to allow for full settlement and contraction. The roof slab was next poured, leaving 6 ft. x 16 ft. openings at each end for pouring the final floor and removal of forms. The interior was then thoroughly cleaned of all formwork and debris, washed clean and the final floor poured. Simultaneously the plastering coat was put on and the "V"-joints cleaned out and poured with hot asphalt. The finishing of the gate house and grouting in of the roof openings made the reservoir ready for the backfilling and the 18 in. earth covering. On September 15th, 1912, the remaining piping was installed and the whole carefully scoured out several times. Then filling commenced, four feet at a time being run in, in order to load the structure gradually. On September 24th the reservoir was put into permanent commission. The wisdom of putting in the expansion joints was apparent as cracks soon appeared in the walls which were in every case isolated at those joints and rendered harmless by the copper strip and subsequent plaster coat. A careful examination six weeks later showed no traces whatever of leakage all drains being perfectly dry. The grading and backfilling had not settled appreciably and everything was satisfactory.

The contractors were the C. F. Graff Construction Company of Seattle and the cost of the work was almost $33,000 not including the piping which cost about $2,000 which figures were comfortably under the engineer's estimates. The designing and supervision was carried out by Messrs. Dutcher Maxwell & Company (now DuCane Dutcher & Company), of Vancouver, with Mr. R. S. Lea acting in an advisory capacity and Mr. N. M. Hall as Resident Engineer.

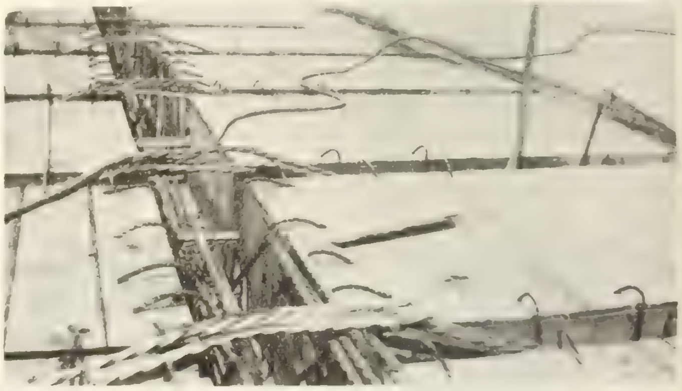

Fig. 7—Roof reinforcement.

Messrs. DuCane Dutcher & Company are completing the waterworks extension of the city by the construction of a new steam power and pumping plant of 2000 horse-power capacity, to cost about $200,000 which will act as an auxiliary and reserve plant to the hydro-electric plant they are building on Barriere River, of 10,000 h.p. with an immediate installation of machinery of 2000 h.p., which will be conveyed to the city over a transmission line, forty miles in length

Brick Surface on Concrete Foundation For Roads

(Contributed)

SERVICEABLE as macadam has been in its day, it must surely be displaced in favor of the hard surfaced roads, according to County Engineer Frank R. Lander, of Cuyahoga County, Ohio, who is the guiding spirit in a movement which has given the vicinity of Cleveland more miles of modern highway than is possessed by any similar locality in the world.

Cuyahoga County tried macadam first, but was fortunate in its early discovery that macadam cannot be made to withstand power traffic. In a recent lecture to engineering students at Ohio State University, Engineer Lander said:

Canal Road, Cuyahoga Co., Ohio

"Extraordinary changes in traffic conditions cannot be foreseen and provided for, and when they come they destroy the pavement that was not designed for them. One of the most striking examples of this change, and one so general in its effect as to be felt all over the country is the tremendous growth of the automobile industry, which is completely revolutionizing our traffic conditions and compelling engineers to look to new methods in road building to take care of a demand that is here to stay.

Before the advent of this new problem in road construction the plain macadam of a more or less crude construction was generally accepted as the most economical and efficient method of surfacing our roads in the rural districts. It was considered the very best type that could be constructed at the price answering all the ordinary purposes of the usual traffic of a farming community, meeting these two conditions of cost and efficiency it has obtained a wide spread use in our state.

Without doubt every county has some of these stone roads while many of them have extensive systems involving a large mileage so that it is impossible to estimate the total amount invested in this form of construction. But whatever the capital invested, it has suffered a marked and sudden depreciation from the introduction of this new method of transportation. The automobile is the natural enemy of the old style road, as the most casual observation will convince most any student, and when this traffic assumes any considerable proportion it will either ruin the road or else involve a maintenance cost that is in itself prohibitive.

I might add that the various treatments applied to macadam for the purpose of preventing the destructive action of the automobile has not up to date proved very satisfactory as demonstrated in the parks and boulevards of the city of Cleveland, and they have tried out nearly everything in the way of patented preparations and processes.

I can safely say keeping within the bounds of conservation that Cuyahoga County has suffered financially to the extent of approximately $200,000 largely through the introduction of this new method of transportation with its destructive effect upon one form of pavement alone, namely, waterbound macadam, not to mention several miles of crushed slag road.

The time was when we based large hopes and expectations on limestone macadam and believed that it solved the problem of durability and cheapness in the improvement of country roads. We made a careful investigation of the general subject of stone roads and a special study of local conditions along each proposed improvement. We made a careful selection of materials, adopted the most approved methods of construction, had the co-operation of the contractors in an honest effort to construct a successful road, but in a comparatively short time, even before the abutting property owners had completed paying the assessment for their proportion of its cost every foot of these macadam roads had made way for a more permanent form of improvement, and the old improvement was not even utilized as a base upon which to construct the new surface. Under the existing laws at that time the county could not repair these roads and the lesser municipalities would not, so the result was just what a road man would predict under such circumstances—a total loss.

Centre Road, Cuyahoga Co., Ohio

Passing now from these general observations on road improvements to the more specific subject of the construction and maintenance of roads in Cuyahoga County we may well be pardoned for expressing a little local pride and indulging in a little personal exultation over our system of roads in the county for we have every reason to believe that we have the finest and best roads for any county in the state and they rank high among the roads of the entire country.

This distinguished position, however, has not been easily or cheaply obtained. We have paid the price in unceasing efforts, unpleasant experiences and discouraging failures, but through it all our officials have held true to their course, and final success seems to have been the reward of their efforts.

After careful study of the heavy traffic conditions of our country, containing within its boundaries a city of over 600,000 inhabitants and possessing a tax duplicate of over $900,000,000, after experimenting with various types of pavements, and observing the experiments of the city of Cleveland and of the smaller municipalities with other types, we have reached the conclusion that the type of improvement that comes the nearest to satisfying all the conditions of traffic in our country is a brick surface laid on a concrete foundation.

Having reached that conclusion we have held to it persistently, advocates of other styles say fanatically, until the county has a network of splendid brick roads leading out in every direction from the county seat to the county line, bringing practically every farm in touch with the city markets all the year around and bringing the farmer and his family in touch with his neighbors as well as the city in every season of the year.

Our experience as to cost in maintenance of these brick pavements since the introduction of the concrete base may be estimated very closely.

At the expiration of the guarantee period of three years some of the contractors preferred to pay into the county the sum required to place their work in condition for final acceptance. We have permitted this in a few cases where the contractor was a non-resident.

The engineers in these cases made a careful estimate of the amount necessary to make these repairs and then required the contractor to deposit a certified check to double that amount to insure the completion of the work by the county after which he was permitted to withdraw the 5 per cent. guarantee fund.

Road	Contract Price	Miles	Estimated Cost Repairs	Amount Retained
Broadview No. 1... ..	$80,000	2.55	$——	$——
Canal No. 1	120,000	4.30	60	120
Fisher No. 1	85,000	3.31	50	100
Lake Shore Blvd. No. 1	83,000	3.01	100	200
Wooster Road No. 2 ..	25,650	1.07	——	——

Addition to Toronto Filtration Plant

THE question of Toronto's water supply has been the occasion of much discussion, the cause of wide comment and a source of great outlay. The citizens fully expected that with the completion of the tunnel under the Bay and the installation of the Island filtration plant that all troubles concerning the water supply were at an end. However, it was soon discovered that there was something wrong and that the filtration beds were not sufficient to meet the city's requirements. A committee composed of Mr. R. C. Harris, Commissioner of Works; Geo. G. Nasmith, Director of Laboratories, Department of Health, and Chas. J. Hastings, Medical Officer of Health, have made investigations. They visited a number of cities where filtration plans were in operation and conducted a series of experiments on mechanical filtration at West Toronto. On July 10th they presented their report to the Committee of Works. The report is illuminating and while it recommends mechanical filters for Toronto it points out the dangers in connection with the present site and recommends the expenditure of a million dollars to increase the capacity of the present filtration operations. The Committee of Works adopted the report. As the matter is one of general importance and interest we give below the full text of the report of the special committee.

There are two standard methods of filtration, viz., slow sand and mechanical, both of which are capable of giving equally effective results. In the former system, the raw water, without chemical treatment, is passed through beds of sand and gravel at the rate of from three to five million gallons per acre per day, and the effluent is carried by gravity to a clear water reservoir, from which it flows to the distributing pumps. In the mechanical system, the water is pumped from the source, and a coagulent, usually in the form of sulphate of alumina, is applied before entering a coagulating basin, where sedimentation takes place for several hours. The water is then passed through rapid sand filters at the rate of from seventy-five to one hundred and fifty million gallons per acre per day, then flowing to a reservoir for distribution by pumping.

The slow sand process is particularly adapted to purifying water without color and with comparatively little suspended matter. The mechanical process will successfully handle any type of water, regardless of color or turbidity, and operates at maximum efficiency when raw water conditions are worst. Ordinarily, the first cost of a mechanical filter installation is considerably less than that of slow sand, and occupies but a fraction of the area required by the latter, while the operating costs are considerably higher than the slow sand method, due largely to the necessity for using coagulent.

For the purpose of acquiring information to enable us to advise the administration, we visited mechanical fifter plants at Montreal, Que.; Little Falls, N.J.; Cincinnati, O.; Columbus, O., and Niagara Falls, N.Y. We also viewed the slow sand plants at Philadelphia, Pa.; Pittsburg, Pa., and Washington, D.C. At each of these cities the type of plant used was giving satisfactory results. At Philadelphia, we found that prefiltration was necessary before admitting the water to the slow sand beds. This pre-filtration was accomplished by what is known as a "roughing filter," which is in effect a mechanical filter without the use of coagulent, and which removes from the water the greater portion of the suspended matter, thereby enabling the slow sand beds to be used at a rating much above normal. At Pittsburg, they were having considerable trouble with the water, and were making plant additions to overcome same. This, however, was not due to any demerit of the slow sand method, but is accounted for by the chemical quality of the raw water. At Washington, the water travels many miles from the source before it reaches the filters, sedimentation taking place in the channels and in certain basins en route.

The mechanical filters above referred to were also giving excellent satisfaction. Especially good results were obtained at Cincinnati, which may, in a measure, be accounted for by the fact that the water is allowed to settle for several days in reservoirs, prior to entering the plant. The works at Montreal are the most recent in point of construction. The Medical Officer of Health and Alderman Rowland, Chairman of the Local Board of Health, also visited a mechanical plant at New Orleans, La., which is giving excellent results. The plants of both types visited were handling river waters.

The slow sand plant located on Toronto Island, consists of twelve beds, having an area of .8 acres each, designed to handle a maximum of five million gallons per acre per day, or four million gallons per filter, making a maximum of forty-eight million gallons per day. However, it is necessary to have at all times at least two filters out of operation for cleaning purposes, making the average output of the plant forty million gallons per day. As a matter of fact, we have, for a considerable time, been operating at the rate of forty-three to forty-eight million gallons per day—considerably in excess of its designed rating.

To make provision for a maximum daily capacity of one hundred million gallons, Mr. Allen Hazen, the expert retained by the City, advises an addition of thirteen slow sand beds, each having an area of .8 acres, which would guarantee an average daily output of sixty-seven million gallons, after making allowance for the beds inoperative because of cleaning operations. For short periods this output could be increased to ninety million gallons per day. This addition, together with the necessary pumping plant and appurtenances, would cost approximately one million dollars. The cost of operation per million gallons, excluding pumping and capital charges, is estimated by Mr. Hazen at $1.83. This seems to be a fair figure.

A mechanical filtration plant, capable of delivering a maximum of sixty million gallons per day, would cost approximately one million dollars—equal in amount to the slow sand filtration.

While we have hereinbefore stated that the first cost of a mechanical filtration plant is considerably less than that of a slow sand, it does not hold good under local conditions, where very expensive foundation work must be provided owing to the sand formation of the Island.

The first cost of each type of plant being practically identical, the annual charges on capital account are not included in the comparisons following. In mechanical filtration, an additional head is required to operate the filters, over and above that requisite in the slow sand method. Making provision for this additional lift, Mr. Hazen estimates the cost of operation per million gallons, exclusive of capital charges, to be $4.80, which, having regard for our investigation, appears a reasonable figure.

For the purpose of illustration, assuming the average daily pumpage for the year 1914 to be fifty-five million gallons, handled exclusively by slow sand filters, the approximate cost, excluding pumping and permanent charges, would be $36,737. If thirty-two million gallons were filtered through the present slow sand beds (their average normal rating), and twenty-three millions through mechanical filters, the annual cost would approximate $61,670, showing a difference of $24,933 in favor of slow sand. In later years, if the proportion of the total supply through mechanical filters largely increased, as it naturally would, the cost difference in favor of slow sand would be greater. From the foregoing, you will observe that, from point of operating cost, the slow sand process is very much cheaper than the mechanical.

We have found in the operation of the Island plant that, at times of easterly storm, the suspended matter carried from Scarboro, and particularly the fine sand carried in the water, has rendered the filters almost inoperative. Our experience in 1912 showed this condition to obtain for four periods, and while by dint of great effort, we have never come to the point where actual cessation of filtering operations was necessary, we feel that a long continued easterly storm would probably so clog the filters as to render the use of raw water necessary.

Again, from the inset of frost in the fall until the advent of warm weather in the spring, it is not possible to wash the sand scraped from the filter beds, by the methods provided, inasmuch as the pipe lines, etc., would freeze and burst, and the sand and water would be frozen during the washing process. To overcome this, it was found necessary last summer to build a storage sand bin in each filter, wherein the sand scrapings for the winter were held. We have been working night and day since spring to wash this accumulation, plus the sand from the beds in operation, and the quantity necessary for re-sanding.

The complete construction of a slow sand filtration plant would take approximately three years, while a mechanical unit should be installed and in operation within eighteen months.

We deem it unfortunate that the Filtration Plant should have been erected at Toronto Island. The ideal place for such installation would have been on Garrison Common, which is within a convenient distance of the Main Pumping Station, and would have been the strategic point at which, if necessary, other than lake water could have been filtered. However, the fact that upwards of $800,000 has been invested in the Island plant compels the retention of the Island as a filtration site, unless the present plant be abandoned, which we, of course, cannot advise.

The formation of the Island is such as to render it an undesirable location for permanent construction of this nature, and the very extensive dredging operations which the Harbor Commissioners purpose undertaking, may cause such changes as to imperil the present or any future installation which may be built thereat. This possibility may be remote, but is of sufficient moment to justify us directing your attention thereto.

The continuity of a filtered water supply for 365 days per year, is in our opinion the dominant factor in the consideration of this proposition. A shut-down during a storm period would entail the use of raw water by the citizens, at a time when it is usually most dangerous, least amenable to chlorine treatment, and liable to produce epidemic.

While the slow sand method shows, on a pumpage basis of fifty-five million gallons per day, a saving of $24,933 per year over the mechanical system, we, your officials charged with the duty of providing an absolutely continuous and safe supply of water, are, irrespective of cost considerations, forced to recommend the adoption of the mechanical system of filtration.

THE total loss by fire as reported in Canada and the United States for the month of June reaches the almost incredible sum of twenty-four and one-half millions, an increase of approximately fifty per cent. over June of last year and twenty per cent. over June of 1911. The loss for the first six months of the present year, however, is considerably less than for the same period of 1911 and 1912. The loss occasioned by fires for the first six months of this year is given as over one hundred and eighteen million dollars. Every organized effort to prevent loss of this kind should be encouraged.

An improved in granite-block paving has been adopted in Philadelphia in the repaving of Broad street between Cumberland and Silver streets. The street was laid with granite-block paving of the old type with large blocks and wide joints. The old pavement was removed and the old blocks were cut in half and relaid with the cut end uppermost and the joints between the blocks were grouted with Portland cement mortar. The pavement obtained in this way has a much smoother surface than the pavement originally laid and the cost of the work was a little less than half the cost of laying a new granite-block pavement.

Waterproofing of Concrete*

Report of Committee—Permeability of Concrete—Effect of Foreign Substances — Asphalt Application — Conclusions

THE committee reports that while it has not been able to arrive at sufficiently definite conclusions to enable it to formulate specifications for the making of concrete structures waterproof or for materials to be used in such work, it has reached certain conclusions which may be of assistance to the constructor in securing the desired result of impermeable concrete. Early in the investigation, the work was found to sub-divide naturally into three branches, and the conclusions reached will be grouped in order under these sub-divisions, which are:

1. The determination of causes of the permeability of concrete as usually made from mixtures of Portland cement, sand and stone, or other coarse aggregate, in proportions of from 1 cement, 2 sand and 4 stone, to 1 cement, 3 sand and 6 stone, and the best methods of avoiding these causes.

2. The rendering of concrete more waterproof by adding to ordinary mixtures of cement, sand and stone, other substances which, either by their void-filling or repellent action, would tend to make the concrete less permeable.

3. The treatment of exposed surfaces after the concrete or mortar has been put in place and hardened more or less, either by penetrative, void-filling or repellent liquids, making the concrete itself less permeable or by extraneous protective coatings, preventing water having access to the concrete.

Considering these several sub-divisions separately and in the order named, the committee finds:

Causes of Permeability of Concrete

That in the laboratory under test conditions using properly graded and sized coarse and fine aggregates, in mixtures ranging from 1 cement, 2 sand and 4 stone, to 1 cement, 3 sand and 6 stone, impermeable concrete can invariably be produced. That even with sand of poor granulometric composition, with mixtures as rich as 1 cement, 2 sand and 4 stone, permeable concrete is seldom, if ever, found and is a rare occurrence with mixtures of 1 cement, 3 sand and 6 stone. But the fact remains, nevertheless, that the reverse obtains in actual construction, permeable concretes being encountered even with 1 cement, 2 sand and 4 stone mixtures and are of frequent occurrence where the quantity of the aggregate is increased. This the committee attribute to:

(a) Defective workmanship, resulting from improper proportioning, lack of thorough mixing, separation of the coarse aggregate from the fine aggregate and cement in transporting and placing the mixed concrete, lack of density through insufficient tamping or spading, and improper bonding of work joints, etc.

(b) The use of imperfectly sized and graded aggregates;

(c) The use of excessive water, causing shrinkage cracks and formation of laitance seams;

(d) The lack of proper provision to take care of expansion and contraction, causing subsequent cracking.

Theoretically, none of these conditions should prevail on properly designed and supervised work, and are avoided in the laboratory and in the field, under test conditions, where speed of construction and cost are negligible items, instead of being governing features as they must be in actual construction. Properly graded sands and coarse aggregates are rarely, if ever, found in nature in sufficient quantities to be available for large construction, and the effect of poorly graded aggregates in producing permeable concrete is aggravated by poor and inefficient field work. Even if we could afford the added expense of screening and remixing the aggregates so as to secure proper granulometric composition to give the density required to make untreated concretes impermeable, it is seemingly a commercial impossibility on large construction to obtain workmanship even approximating that found in laboratory work. It therefore seems that we can secure impermeable concrete most economically by adopting some special waterproofing treatment.

Addition of Foreign Substances to Cement or During Mixture

The committee finds that in consequence of the conditions outlined above, the use of substances calculated to make the concrete more impermeable—either incorporated in the cement or added to the concrete during mixing—has become general. This has resulted in the development and placing on the market of numerous patented or proprietary waterproofing compounds, the composition of which is more or less of a trade secret.

While it has been impossible for the committee to test all of the special waterproofing compounds being placed on the market, it has investigated a sufficient number of these, as well as the use of certain very finely-divided, naturally-occuring or readily-obtainable commercial mineral products, such as finely-ground sand, colloidal clays, hydrated lime, etc., to form a general idea of the value of the different types. The committee finds:

(a) That the majority of patented and proprietary integral compounds tested have little or no permanent effect on the permeability of concrete and that some of these even have an injurious effect on the strength of mortar and concrete in which they are incorporated;

(b) That the permanent effect of such integral waterproofing additions, if dependent on the action of organic compounds, is very doubtful;

(c) That in view of their possible effect, not only upon the early strength, but also upon the durability of concrete after considerable periods, no integral waterproofing material should be used unless it has been subjected to long-time practical tests under proper observation to demonstrate its value, and unless its ingredients and the proportion in which they are present are known;

(d) That in general, more desirable results are obtainable from inert compounds acting mechanically, than from active chemical compounds whose efficiency depends on change of form through chemical action after addition to the concrete;

(e) That void-filling substances are more to be relied upon than those whose value depends on repellent action;

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* American Society for Testing Materials.

(f) That, assuming average quality in sizing of the aggregates and reasonably good workmanship in the mixing and placing of the concretes, the addition of from 10 to 20 per cent. of very finely divided void-filling mineral substances may be expected to result in the production of concrete which under ordinary conditions of exposure will be found impermeable, provided the work joints are properly bonded, and cracks do not develop on drying or through cutting change in volume due to atmospheric changes, or by settlement.

External Treatments

While external treatment of concrete would not be necessary if the concrete itself, either naturally or by the addition of waterproofing material, was impermeable to water, it has been found in practice that in large construction, no matter how carefully the concrete itself has been made, cracks are apt to develop, due to shrinkage in drying out, expansion and contraction under change of temperature, and moisture content and through settlement.

It is, therefore, often advisable on important construction to anticipate and provide for the possible occurrence of such cracks by external treatment with protective coatings. Such coating must be sufficiently elastic and cohesive to prevent the cracks extending through the coating itself. The application of merely penetrative void-filling liquid washes will not prevent the passage of water due to cracking of the concrete. The committee has, therefore, divided surface treatment into two heads:

(a) Penetrative void-filling liquid washes;

(b) Protective coatings, including all surface applications intended to prevent water coming in contact with the concrete.

While many penetrative washes are efficient in rendering concrete waterproof for limited periods, their efficiency is apt to decrease with time and it may be necessary to repeat such treatment. Some of these washes may be objectionable, due to discoloring the surface to which they are applied. The committee, therefore, believes that the first effort should be made to secure a concrete that is impermeable in itself and that penetrative void-filling washes should only be resorted to as a corrective measure.

Asphaltic Coatings

While protective extraneous bituminous or asphaltic coatings are unnecessary, so far as the major portion of the concrete surface is concerned, provided the concrete—either in itself or through the addition of integral compounds—is made impermeable, they are valuable as a protection where cracks develop in a structure. It is therefore recommended that combination of the two methods—integral and extraneous waterproofing—be adopted in especially difficult or important work.

Considering the use of bituminous or asphaltic coatings, the committee finds:

(a) That such protective coatings are often subject to more or less deterioration with time, and may be attacked by injurious vapors or deleterious substances in solution in the water coming in contact with them;

(b) That the most effective method for applying such protection is either the setting of a course of impervious brick dipped in bituminous material into a solid bed of bituminous material, or the application of a sufficient number of layers of satisfactory membranous material cemented together with hot bitumen;

(c) That their durability and efficiency are very largely dependent on the care with which they are applied.

Such care refers particularly to proper cleaning and preparation of the concrete to insure as dry a surface as possible before application of the protective covering, the lapping of all joints of the membranous layers, and their thorough coating with the protective material. The use of this method of protection is further desirable because proper bituminous coverings offer resistance to stray electrical currents, the possible attack from which is referred to later.

So far, the committee has considered only concretes of the usual proportions, namely, those ranging from 1 cement, 2 sand and 4 stone, to 1 cement, 3 sand and 6 stone. It has been suggested that impermeable concretes could be assured by using mixtures considerably richer in cement. While such practice would probably result in an immediate impermeable concrete, it is believed by many that the advantage is only temporary, as richer concretes are more subject to check cracking and are less constant in volume under changes of conditions of temperature, moisture, etc. Therefore, the use of more cement in mass concrete would cause increased cracking, unless some means of controlling the expansion and contraction be discovered. With reinforced concretes the objection is not so great, as the tendency to cracking is more or less counteracted by the reinforcement.

It has also been suggested that the presence in the cement of a larger percentage of very fine flour might result in the production of a denser and more impermeable concrete, through the formation of a larger amount of colloidal gels.

Neither of these suggestions have been especially investigated by the committee. Both appeal to the committee, however, for the reason that they substitute active cementitious substances for the largely inactive void-filing materials previously recommended, thus increasing the strength of the concrete.

Conclusion

In conclusion, the committee would point out that no addition of waterproofing compounds or substances can be relied upon to completely counteract the effect of bad workmanship, and that the production of impermeable concrete can only be hoped for where there is determined insistance on good workmanship.

The production of impermeable concrete has assumed greater importance since the appointment of this committee, owing to the well-known injurious action of saline or alkaline waters and to the suggested possible effect of the moisture in concrete occasioning or aggravating electrical action from stray currents.

Originally, the question of waterproofing involved mainly the physical troubles resulting from water passing through concrete without any special consideration of its effect on its durability, or other than a gradual leaching out of the cement. Recent developments suggest the possibility that owing to the increased conductivity of damp concrete to electrical currents, such currents, if present, may so affect damp concrete as to seriously lessen its integrity, and this possibility further emphasizes the importance of the recommendation that no waterproofing compound of unknown chemical composition be added to concrete, as recent tests seem to show that the action of electrical currents is aggravated by the presence of certain solutions.

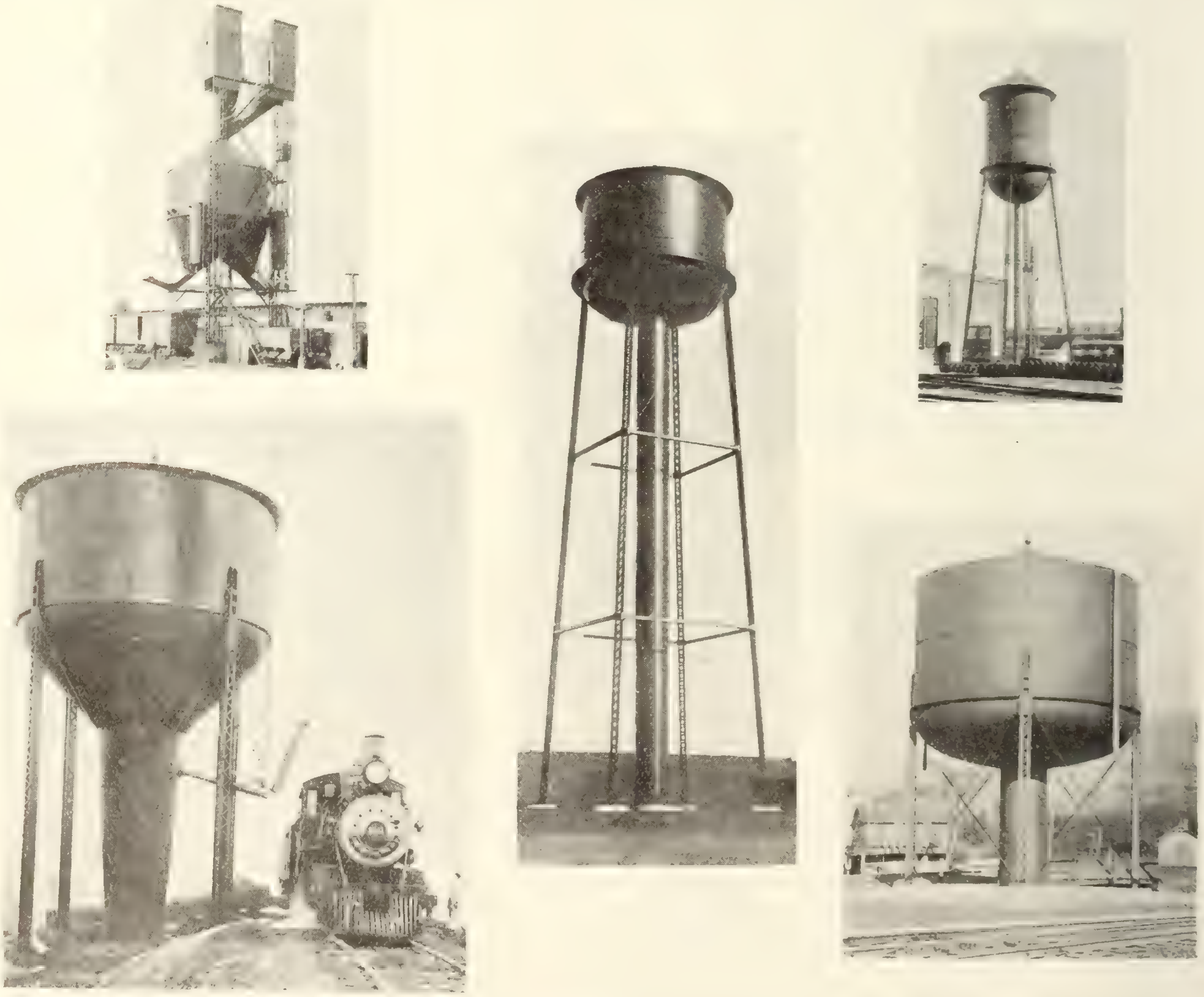
Canadian Plant of Chicago Bridge and Iron Works

The Chicago Bridge and Iron Works has built and is now operating at Bridgeburg, Ont., a new plant for the construction of steel water towers and standpipes. This company claims to be the first to make commercially possible the hemispherical bottom steel tank and since to have brought out all of the important improvements on the original design, such as the elliptical and conical bottom tanks, methods for heating the tanks and improvements in the construction of details, such as the revolving ladder for all types and the brass lined expansion joint for the hemispherical bottom type.

About 1893 Mr. Horace E. Horton, then president of the company, conceived the idea that the tower posts could be rivetted directly to the sides of the steel tank and that the tank sides themselves would act as vertical girders to transfer the weight of the water to the posts. Up to this time all steel tanks had been built with flat bottoms or with some indirect and awkward method of attaching the posts to the tank. The hemispherical type of tank once properly designed quickly replaced the old-fashioned standpipe except where a hill was available and centrally located.

About ten years ago Mr. George T. Horton, now President of the Chicago Bridge and Iron Works, brought out and patented the elliptical bottom tank, an improvement on the hemispherical bottom type. The new design, as shown herewith, is built of large diameter and shallow depth, thus approaching as nearly as possible the absolutely uniform pressure which is so desirable.

The special feature of the design is the large steel riser pipe rivetted directly to the tank bottom. This construction does away with the leaky expansion joint and wood frost casing which previously had been used with every other type of tank. The diameter of this riser pipe varies from three to six feet depending on the climate, the size being made in all cases large enough



Improved designs of elliptical and conical bottom tanks.

to prevent interruption of service from ice. Some ice will form on the side of the pipe but not enough to prevent circulation. The success of this idea is well shown by the large number of tanks of this design which have been in successful operation through the northern part of the United States and Canada.

The tank bottom is practically flat where the riser pipe is attached and therefore is flexible and in itself an ideal expansion joint. This is illustrated by a 200,000 gallon tank, 175 ft. to the bottom, which has been in successful operation for two years.

The large riser pipe, besides doing away with the wooden frost casing and expansion joint, also serves as a settling basin. The inlet and outlet pipes extend up into the large riser several feet so as to be above any possible accumulation of sediment and a washout valve operated from the outside is installed at the bottom riser so that the tank can be cleaned without emptying or interrupting its service. This feature, together with the elimination of the expansion joint and wooden frost casing has proved so popular that the elliptical bottom type of tank, designed only for locomotive service, is now widely in use for municipal plants and sprinkler systems.

It was found that where railroads are using muddy river water that the self-cleaning feature of the tank was of great importance and in order to facilitate the precipitation a new design was brought out. This tank as can be seen from the accompanying cuts, differs from the elliptical bottom tank only in that the conical bottom makes a minimum angle with the vertical of 45 degrees. This type is recommended for use where the water contains a very considerable amount of sediment. The Chicago Bridge & Iron Works tanks are in service on eighty-five railroads in the United States and Canada. Some of the large systems are the Transcontinental and Grand Trunk Pacific, Chicago Burlington & Quincy, Chicago & Northwestern, Pennsylvania and New York Central lines. The tanks have been installed in numbers from 1 to 156 per railroad.

For municipal service the large riser pipe type of tank does not require any heating except under very unusual circumstances. For sprinkler service, where the water remains constantly stationary the tank is usually heated with a brass steam coil. The same method is used for locomotive service tanks which are not frequently used when steam is available. If the locomotive tank is located at a point where the traffic is reasonably heavy, no heating is needed. For isolated locomotive tanks where no steam supply is available a heating stove is installed in the bottom of the large riser pipe which has its bottom raised about six or seven feet above the top of the foundations. The lower six or seven feet of the riser pipe is then lined on the inside with brick and forms a heater house. The stove pipe extends directly up through the centre of the tank out through the roof. This company asserts that they were the first to propose this method of heating when these tanks were adopted as a standard on the Transcontinental Railway between Superior Junction and Cochrane. This method of heating has proved very satisfactory and has since been adopted on other lines.

The company further claims that other manufacturers have brought out tanks very similar in appearance to those built by the Chicago Bridge and Iron Works, and that in order to avoid infringement of the patents held by Mr. Norton they provide an expansion joint to connect the riser pipe to the tank bottom, by investigating the construction of this connection the imitation can always be distinguished from the original design. The Chicago Bridge & Iron Works has in operation besides its original plant at Chicago and its new plant at Bridgeburg, Ontario, a shop at Greenville, Pa., near Pittsburgh. These favorable locations make it possible to avoid all excessive freight and duty charges.

The Essential and the Non-Essential in Pure Water*

SUCH standards of purity as have been tentatively advanced in the past are purely technical in character. The ordinary sanitary analysis, on which such standards are based, consists of a long list of determinations, both qualitative and quantitative, and the usefulness of many of them is supposed to lie in the information they afford with respect to whether the water has ever been polluted with animal excrement, and when and in what quantities. If it be assumed that water is free of pathogenic bacteria, and it can be shown that mere organic and mineral matter does not deleteriously affect the health of the consumer, what possible good can come from laboriously and expensively analysing water for "oxygen consumed," "nitrites," "nitrates," "chlorine," and "total solid matter"? Why would it not be much better to restrict the ordinary chemical analysis to the really important, although simple, determinations, such as taste, odor, color and turbidity, in order to establish the range in its physical characteristics, and for suspended matter, iron and hardness to furnish a line on the really essential features of its chemical makeup?

How many waterworks are supporting laboratories at no small cost for the purpose of filing file after file with the results of chemical analyses which not only are incapable of definite interpretation, but which would be of no aid to the superintendent in the operation of the works if they were? In many cases such laboratory work is continued as routine because similar work is done in so many other water works laboratories.

Therefore, why not pay more attention to the recording only of such important data as will give clear, continuous and valuable information that any waterworks superintendent can understand, and which will serve as a reliable guide in the operation of the works under him? It is astonishing how much really valueless information is available on the nitrogen content of waters, and how comparatively little on color, turbidity and hardness. The filtration man does not strive for the removal of nitrogenous matters from water, per se, but he certainly bends every effort to the removal of color and turbidity, and very often, too, of hardness and iron. Let us now consider briefly of what real value is the chemical analysis so commonly carried as routine work in the waterworks laboratory, taking up each determination in the order in which it usually appears on the record sheets.

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* Abstract of Paper by Mr. Geo. A. Johnson before the American Water Works Association.

Value of Chemical Analysis

Temperature.—Temperature observations are of some value in connection with the operation of a filtration plant, because it is well known that all filters do their poorest work during cold weather; and where coagulating and softening chemicals are employed in water treatment it is equally well known that the coagulating and softening reactions are measurably slowed up by low temperatures, and accelerated by high temperatures. Temperature observations at different depths in ponds, lakes and reservoirs often furnish valuable information with respect to stratification, etc., and readily explain the reason for the periodic unsatisfactory appearance and taste of some waters, due to spring and autumn "overturn."

Turbidity.—The ordinary citizen does not look with favor on a water which is turbid; that is, carries in suspension mud, silt and clay in quantities sufficient to impart to it a marked cloudiness or a distinct muddy appearance. It is not so much a case of whether such matter is actually injurious as that it is not agreeable to the sight, and promotes other aesthetic prejudices such as those against taking into the system so much actual mud and dirt. Therefore, in all up-to-date cities where the water supply is turbid it is the custom to treat it in some way before delivering it into the mains, in the endeavor to remove the turbidity and make it agreeable to the sight.

Color.—Many first-class water supplies are highly colored. This yellowish color originates for the most part in vegetable extractions, and where stains are usually prominent. Such color has no sanitary significance, but offends the aesthetic sense of sight, and it has become the custom in large cities to use every reasonable effort to effect its removal before the water is delivered into the mains.

Bacterial decomposition of the deposits on the bottom of some lakes deprives the lower strata of their oxygen, and such layers become highly colored. With the periodic appearance of the "overturn" in spring and autumn these colored layers are brought to the surface, distributing the color throughout the entire body of water. Furthermore, under the anaerobic conditions sometimes existing at the bottom of lakes and ponds, iron is thrown into solution. On being brought into contact with air this iron is oxidized, imparting to the water a reddish brown color.

Under ordinary circumstances sun bleaching is actively felt for a depth of about 1 ft. beneath the surface, and in a month's exposure to the sun's rays the color removal will amount to about 20 per cent.

By treating colored waters with chemicals all vegetable stains can be removed. Ozonization, and the use of oxygenated compounds of calcium, sodium or chlorine will effectively decolorize water, but their high cost is usually prohibitive were there no other objections to these forms of treatment.

Filtration of colored water through clean quartz sand will not effect measurable decolorization, and it is well known that without the aid of a coagulating chemical slow sand filters will not consistently remove more than about 20 per cent of the dissolved color in water. The most efficient and satisfactory method of water decoloration is by coagulation, followed by filtration.

Taste and Color.—Objectionable tastes and odors are sometimes naturally imparted to water through the growth of certain forms of microscopical life, and when such are recorded in the laboratory are followed by the taking of prompt measures to correct them, such as the application of copper compounds and the like to the affected water in the lakes and reservoirs on the collecting and distributing system. Such tastes and odors have no sanitary significance, but are aesthetically objectionable.

In some cases certain industrial wastes discharged into the water above the intake will impart an offensive taste and odor to it. The routine test at the laboratory should furnish reliable data in this line, and allow such odors and tastes readily to be traced to their source, and thus make their elimination possible.

Nitrogen.—All organic matter naturally passes through a cycle of changes before arriving at the final stage of nitrate or saltpetre, and free and albuminoid ammonia, as determined in the chemical analysis of water, represent the nitrogenous organic matter in its earlier transitional stages. The presence in water of nitrogen in this form furnishes circumstaitial evidence of its prior pollution, since fecal matter invariably contains such products. The word "circumstantial" is used advisedly, for the reason that vegetable matter from swampy areas, although remote from sources of animal pollution, often contributes nitrogen in these forms in considerable quantities. As such it would, of course, have no sanitary significance.

By some it is considered that the ratio between free and albuminoid ammonia serves as a fairly accurate guide in determining the character of the organic matter contributing it; and that a high free-albuminoid ammonia ratio coincident with low chloride and nitrates characterize vegetable organic matter; and, conversely, that high free ammonia with high amounts of chlorides, characterizes animal organic matter. In a very general way this is true, but since by chemical analysis one can obtain from vegetable matter precisely the same combination in free and albuminoid ammonia, nitrites and nitrates, that come from the analysis of water polluted with animal excrement, the evidence furnished is certainly but circumstantial.

And after all of what sanitary significance is mere organic matter, whether animal or vegetable, in the absence of specific germs of disease? Eliminating the aesthetic phase, and the possible effect of imagination on the human organism, it actually has very little sanitary significance, as will be shown later on.

Chlorine.—The chlorine found in water is not of particular sanitary significance, but inasmuch as sewage and domestic wastes contain large amounts of salt, its presence in water supplies indicates that it may have come from such sources. The water supplies of seaboard cities, even when unpolluted, are normally higher in chlorine than unpolluted inland supplies, due to the salt blown in from the ocean. In certain inland localities unpolluted water supplies are high in chlorine , due to mineral deposits in the soil. Therefore, like nitrogen, high amounts of chlorine in water merely furnish circumstantial evidence of dangerous pollution.

Total Solids.—When a sample of water is evaporated to dryness the dry residue represents the total solid matter which the water originally contained. This includes, not only the matter in suspension which rendered the water turbid, but matters in solution. The results have little or no sanitary significance.

Volatile Solids.—When the dish containing the "total solids" is heated the so-called "volatile" solids are burnt up. These are supposed to represent the organic matters present in the water, and some analysts attempt to characterize these by their charred appearance and odor when burning. Such determinations have little or no value in water analysis.

Hardness.—Water, in its passage over and through the soil, dissolves and picks up certain minerals, among the most common being lime and magnesium. These give to the water its hardness.

There are two kinds of hardness, namely, temporary and permanent. The carbonates of lime and magnesium, held in solution by the dissolved carbonic acid in the water, constitute the temporary hardness and may be almost completely softened by boiling. Waters which, in addition to dissolved carbonates, contain in solution calcium and magnesium sulphates, chlorides or nitrates, cannot be effectively softened by boiling. Such hardness is termed permanent.

It is difficult to set a maximum limit for the amount of hardness a water may contain and yet be considered satisfactory. In the lake cities a total hardness of 100 parts per million is considered satisfactory, yet such a hardness in Eastern Atlantic cities would be considered unsatisfactory. At Columbus, O., where the total hardness of the raw Scioto River water ranged from 41 to 372 parts per million, and averaged 222 parts during the year 1912, the water is softened, and the endeavor is always to deliver to the consumers a water having a total hardness of 100 parts per million or less. In 1912 the actual hardness of the Columbus tap water averaged 79 parts per million.

Hardness determinations are highly important, and should be carried as routine in all waterworks laboratories. By determining the total hardness and the alkalinity (the difference generally representing the permanent hardness) an excellent line is afforded on this important characteristic of water. The records are of value in settling discussions as to the advisability of softening the water; in soap consumption; on its utility for various industrial purposes, and on its suitability for steam raising. Where a coagulating chemical is used in the purification of a water supply it is indespensable, owing to the fact that a certain amount of alkalinity is required to decompose every grain of added coagulant, otherwise if the alkalinity be deficient, coagulation will be unsatisfactory and undecomposed coagulant appear in the treated water; an inadmissable condition. The sanitary aspect of hardness will be referred to later on.

Iron.—Practically all natural waters contains iron. The soil contains iron in the form of sulphide or oxide. Being dissolved out in water it may be present as an oxide, a carbonate, or as "humic acid," the original organic compound which holds ferric oxide in solution.

Ferric oxide can be removed by sedimentation and filtration; ferrous carbonate by aeration through the opportunity thus afforded for the escape of carbonic acid; and if the iron happens to be in combination with organic acids, the addition of alkalies will break up the loose combination and liberate the iron.

Generally speaking, no water can be considered entirely satisfactory which contains more than about one part of total iron per million parts of water. Even a less quantity than this is desirable, as a taste is sometimes perceptible in water containing around one part of iron.

Carbonic Acid.—The determination of free carbonic acid in water is of importance, as it is well understood that it is an active agent in the corrosion of metals, particularly iron and lead. "Red water" troubles are often to be laid at the door of free carbonic acid, in some measure at least, and where it is present in relatively large quantities steps are often taken to remove it by adding lime to the water.

Where coagulating chemicals are used, particularly where lime is not employed with the salts of iron and aluminum which are more commonly used as coagulants, the determination of free carbonic acid furnishes valuable information, as with each grain of added coagulant there is a corresponding increase in the amount of free carbonic acid.

Significance of Common Constituents

Eliminating from discussion for the time being all forms of bacterial and other microscopic life, let us consider the evidence bearing on the sanitary significance of the more common constituents of water, as determined by chemical analysis.

Physical Features.—Under this heading, of course, come taste and odor, color and turbidity. What effect on the health of the consumer have these features as applied to water?

A water heavily charged with mud will naturally possess an argillaceous or clayey taste and odor, the same being intensified on heating. This is not agreeable to many. Assume that a water contains on the average 100 parts per million of suspended matter. In a year's time an adult will consume in this way about 1/7 lb. of such matter, or some 5 lbs. in a lifetime. This quantity in itself cannot be considered as having any sanitary significance.

Water which is naturally highly colored sometimes possesses a slight astringent taste, but such coloring matters, being vegetable stains for the most part, can have no deleterious effect on the health of the consumer.

Some waters possess offensive tastes and odors due to growths in them of certain higher forms of microscopical life, and due to the liberation by them of essential oils in process of their development or decay. These are relatively small in quantity, and cannot in themselves actually cause serious disturbances in the body of the consumer.

Some waters are so heavily polluted with certain industrial wastes as to give them a highly objectionable taste and odor. Probably the most prominent in this line are waters tainted with the waste liquids resulting from the destructive distillation of wood and coal. Creosotes, phenols and similar compounds are especially offensive and far reaching. A very few drops of creosote will impart a marked taste to a gallon of water.

Now as to the sanitary significance of such substances in water. Let us assume that the 200 lbs. of creosotes and phenols were all pure creosote. The medicinal dose of creosote may safely be taken at ten drops. To get a single medicinal dose from water polluted as above it would be necessary for one to consume over 30 gallons of the water. Furthermore, creosote is not a cumulative poison, but is rapidly excreted through the pores of the body, leaving nothing behind.

Finally, then, those physical characteristics natural to many surface waters which lend to them an unsightly appearance, or an objectionable taste and smell, are of actual injury only in so far as they may affect the individual imaginatively. This feature is not to be disregarded, however, for there is no doubt that many thousands of people actually have thought themselves into the grave. One of the first lines of common sense water logic, therefore, is that drinking water shall be free from perceptible quantities of color and turbidity, and that it shall possess no disagreeable, or actually foreign, tastes or odors.

Organic Matter.—Under this heading, although it may not be precisely correct, we will include all nitrogenous matter, such as free and albuminoid ammonia, nitrites and nitrates; and carbonaceous matter, such as "oxygen consumed" and the like; in short, all organic matter found in water, both of vegetable and animal origin, whether derived from human or animal excrement or from the wash of woods and fields. It is necessary at this point only to eliminate living bacteria from the discussion. They will be considered later on.

There is nothing in the complex compounds of organic matter commonly found in water supplies which need give alarm to the water consumer. Prior bacterial decomposition of such matters, doubtless, is instrumental in producing certain ptomaines, which in sufficient quantity would exert in some degree a toxic effect on the human organism. But while such conditions might be conceived of in sewage, in water, even after it has received sewage up to the limit of its powers of digestion, the dilution of such substances is too great to warrant serious consideration being given to this feature.

Chlorine.—The effect of chlorine on the public health, in the quantities and as found in water, is nil. The average individual consumes at the table each day many times as much salt as is ever present in a drinking water supply.

Hardness.—It is the contention by some physiologists that those constituents which make water hard are deleterious to the public health. In some cases this view would seem to have considerable merit. The traveler is unpleasantly reminded of the effects of abruptly changing from a soft to a hard water, and vice versa, but there are no statistical data to prove that in general the hardness of a water has any clearly defined effect one way or the other on the public health. Although it is strongly maintained by some that various specific diseases such as urinary calculi, goitre, etc., are produced by the continued use of very hard waters, the confirmatory data to prove out this view are lacking. It is much more probable that the effect of hard waters is really restricted to simple gastric and intestinal disturbances, which are temporary only in their effect.

Iron.—The chief objections to iron in a water supply, from a sanitary standpoint, are its undesirable taste and appearance, when present in sufficiently large quantities. Where it comes from the source of supply it can readily be removed by aeration and filtration; and when it comes from the service pipes through the corrosive action of carbonic acid and other agents, corrective measures have to be taken before the water is delivered into the mains.

The sanitary significance of iron in water may be considered as nil, for when present in large amounts its undesirable taste would preclude its use.

Microscopical Examinations.—Water supplies are examined for the higher forms of microscopical life as a routine procedure in but few places. In the majority of cases such examinations are carried on only at times when the water possesses objectionable tastes and odors, the endeavor at such times being to locate and identify the organism which is causing the trouble. Knowing the kind of organism, it is relatively easy to destroy it at its source through chemical treatment.

Bacteria

It is the almost universal custom in water works laboratories to make daily analyses of the water supply for total numbers of bacteria; in some the number of bacteria developing on special media at body temperature is also determined; and in many presumptive tests for B. coli are carried as daily routine. There is no question that the results of bacterial analysis are of more value in determining the hygienic quality of a water than the entire chemical and microscopical data laboriously and expensively obtained.

Bacteriology is a comparatively new science, and by no means a precise one. It is a matter of common knowledge that with the methods of analysis of today the bacteriologist can isolate and positively identify specific disease germs only with the greatest effort and difficulty, and even then it is of primary importance that their number and virulence be also known before the water can justly be condemned. The finding in water of germs known to be associated in one way or another with disease-producing germs furnishes valuable circumstantial, but nevertheless indefinite evidence.

Sometimes the presence of comparatively large numbers of bacteria in water has no sanitary significance whatsoever. This is true even when the evidence is quite positive that among the number are forms whose best known habitat is the intestines of man and domestic animals. Waters draining uninhabited areas, and therefore far removed from opportunities of pollution, particularly where the areas drained are swamps, sometimes show high numbers of bacteria.

The test for B. coli is the usual way the present-day bacteriologist has of ascertaining the relative purity of waters, also of forming a judgment of the purity of an individual water. This organism is the normal inhabitant of the intestines of man and some domestic animals, and of course is always present coincidentally with the typhoid germ when a person is suffering from that disease. It is equally true that in the vast majority of cases where B. coli is found in water the typhoid bacillus is absent. Therefore, where B. coli is found the inference that B. typhosus is or may be present furnishes circumstantial evidence purely, yet because the typhoid bacillus may be isolated from water supply with the greatest difficulty, and because the reverse is true of the colon bacillus, the presence or absence in water of the latter organism is looked upon as the surest index of sewage pollution available to modern water bacteriology.

But the colon bacillus found, even if the number of coli be large, may have come solely from the excreta of domestic animals, or even from fish, and such animals do not suffer from typhoid fever. Again, the bulk of the coli may come from the excreta of perfectly well persons, and where a water is contaminated with city sewage this is always the case. So its presence in water merely furnishes evidence that it has been polluted with animal excrement; that typhoid fever germs may be present, but no proof that they are.

A water may contain a few stray coli and yet be perfectly safe to drink, for they all may have come from domestic animals. Furthermore, coli may have entered a water months before, even accompanied by typhoid germs; but both of these organisms, being out of their natural habitat in water, quickly become attenuated and lose their virulence.

In judging a water on the presence in it of B. coli, it is necessary to possess a knowledge of the number of these germs and of their vitality, in order that it may be known whether the pollution is recent, in what relative amount, or if it occurred a long time in the past and the germs found represent the attenuated survivors of those which entered the water originally.

The numbers of bacteria in a water and the results of the test for coli have definite, though limited, value. High numbers of bacteria and the persistent appearance of B. coli can only mean a dangerously polluted water. Not that it is actually unsafe to drink all of the time, but that at any time it may become so. Low numbers of bacteria and no coli can only mean a water of high sanitary purity.

The absolute value of bacteriological examinations is difficult to express except in this manner. B. coli may be present in a water every day for weeks and months on end and the water be perfectly safe.

Almost all of the supplies show evidence of prior contamination. The mark is there but what does it signify? Compare Kansas City with New York. We know that the water supply of the former, with either its high turbidity or hardness, would not be acceptable to the water consumers of New York City, yet the bacterial results at Kansas City make a more satisfactory showing, and the typhoid fever death rate in the two cities was virtually the same in 1912.

It is unnecessary to go farther in a discussion along comparative lines. A supply which is satisfactory in one city would be held as unsatisfactory in another, although both are safe to drink. Communities accustomed to turbid or colored waters do not instinctively rebel against them, but only after they have seen and drunk clear and colorless waters. With hard water it is the same, but in a less degree, for the householder is aware that here lies the reason for high soap consumption, and the steam raiser objects because of the cost of keeping his boilers free from incrustation and corrosion. But in a general way that is all.

We must acknowledge that it is not feasible to obtain from surface sources public water supplies which are free from all evidences of sewage contamination, but there is no reason to doubt the entire feasibility of so purifying contaminated supplies that they will be safe and wholesome. Such purified waters will still contain in reduced quantity the original sewage matters, but are made satisfactory to all the senses, and from a physical and chemical standpoint may justly be accepted as reasonably pure and entirely wholesome waters.

As to the bacteria; no matter what their significance, as shown by the usual sanitary analysis, sedimentation and filtration will reduce their original number to a relatively small residual, and sterilization effectively will remove the last vestige of potential danger which the contaminated water originally possesses. Therefore, what matters it, within the limits of reason, how contaminated the water was originally, if by purification, which is called for in connection with practically all surface waters, we can obtain at moderate cost a clear and colorless water, one which does not possess objectionable tastes and odors, and one in which bacterial life is reduced to a practical minimum? Is such water not to be classed as "pure and wholesome"? It certainly may justly be termed "wholesome," and reasonably "pure," since its consumption is conducive to health, even though the strict and generally accepted interpretation of the word will not allow us to term it absolutely "pure."

The writer lacks the temerity to set down a list of standards of purity for public water supplies; but after what has been said above he does not hesitate to say that in his humble opinion "pure and wholesome water" should mean water which is free from noticeable turbidity and color, offensive tastes and odors, and forms of bacteria known to produce disease. Waters which in their natural state or by purification cannot be made to comply with this standard are without the pale.

The writer submits that a water reasonably free from color, turbidity and objectionable tastes and odors is not impossible, or even difficult, of achievement; nor is it difficult to pass judgment on a water that does not comply with these requirements. With the bacterial requirement it is vastly different, for the reason that modern methods of bacteriological analysis are not sufficiently precise and speedy to allow of the ready detection of disease germs in water. How then is it possible to meet this most essential requirement in the light of the existing bacteriological methods? Until the typhoid bacillus and other germs which may produce disease can promptly and certainly be detected in water, it cannot be done.

Would it be heresy to say that B. coli may be found in a water day after day and month after month, even in 1 c. c. volumes, and yet that water be perfectly wholesome and innocuous? Such a condition can be imagined, even realized, for to become a producer of typhoid fever there would be required among those persons contributing the coli persistently found in the water an individual suffering from typhoid or convalescent from that disease. Indeed, the coli might all come from the harmless excrement of domestic animals, the same being used as fertilizer on the watershed and washed into the stream at time of rains and thaws.

B. coli when found in water is a danger signal. There is no doubt about that. The more that are found, and the oftener they are present, indicates increased and continuous contamination. It does not prove; it furnishes circumstantial evidence that the water may contain germs of typhoid fever. The greater the pollution the larger must be the number of people contributing to the pollution. Hence by increasing the number of people the danger is proportionately increased, because of the greater number of individual possible sources of typhoid fever. Therefore the number of coli present in a water is of significance, yet with one colon bacillus there may be a typhoid, and with a hundred, none.

In the New York water supply in 1912, B. coli was found in 10 per cent. of the 1 c. c. samples examined; in 3 per cent of the samples of the same volume at Cincinnati; at Columbus daily tests of this volume showed it to be present only on two occasions during 1912; and at Minneapolis and Pittsburgh it was never present. The typhoid fever death rates in those cities that year were 10, 7, 19, 11 and 6. What absolute proof is afforded by the above colon results with reference to the typhoid fever death rate, which, after all, is the surest index of the hygienic quality of a water supply?

Where water is filtered and made satisfactory on physical grounds, there is absolutely no excuse for the persistent presence in it of living B. coli or typhoid fever germs when hypochlorites or other effective germicides are employed as a finishing touch in the purification process. But nevertheless if they do appear at times the water cannot, without other good reasons, be condemned as unsafe to drink.

Careful filtration followed by sterilization presupposes among other desirable features a water of high bacterial purity, and by these means, provided the purification processes are carried through with skill and continued vigilance, everything within the reach of modern practice has been done to remove the impurities it may have contained; and it is plain that such purified water cannot be denied a place in the class of reasonably pure and wholesome waters

New General Hospital, Toronto

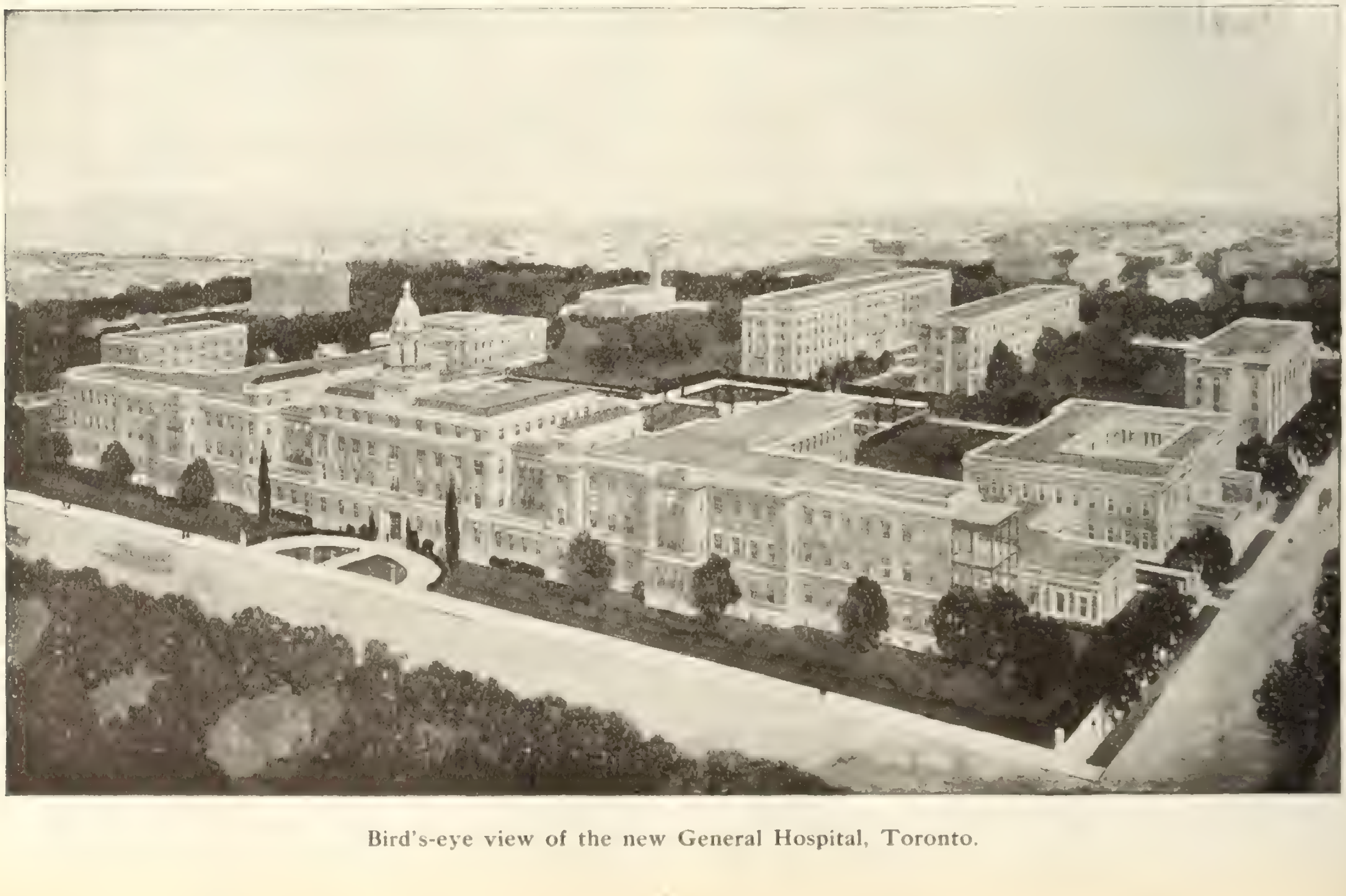
Construction Features—Brick and Iron Work—Wall Coatings—Floor Covering and Tiling—Equipment—Heating and Ventilation—Elevators

THE new General Hospital, Toronto, is acknowledged to be the best equipped institution of the kind on the continent. The corner stone was laid by Earl Grey, then Governor-General of Canada, on April 11th 1911. It was formally declared open June 19th, 1913, and during the second week of July the patients were transferred from the old hospital on Gerrard street to their new quarters. The rapidity with which this great undertaking has been completed speaks volumes for the board of directors and the staff of architects, engineers and contractors whom they engaged to carry their mandates into effect.

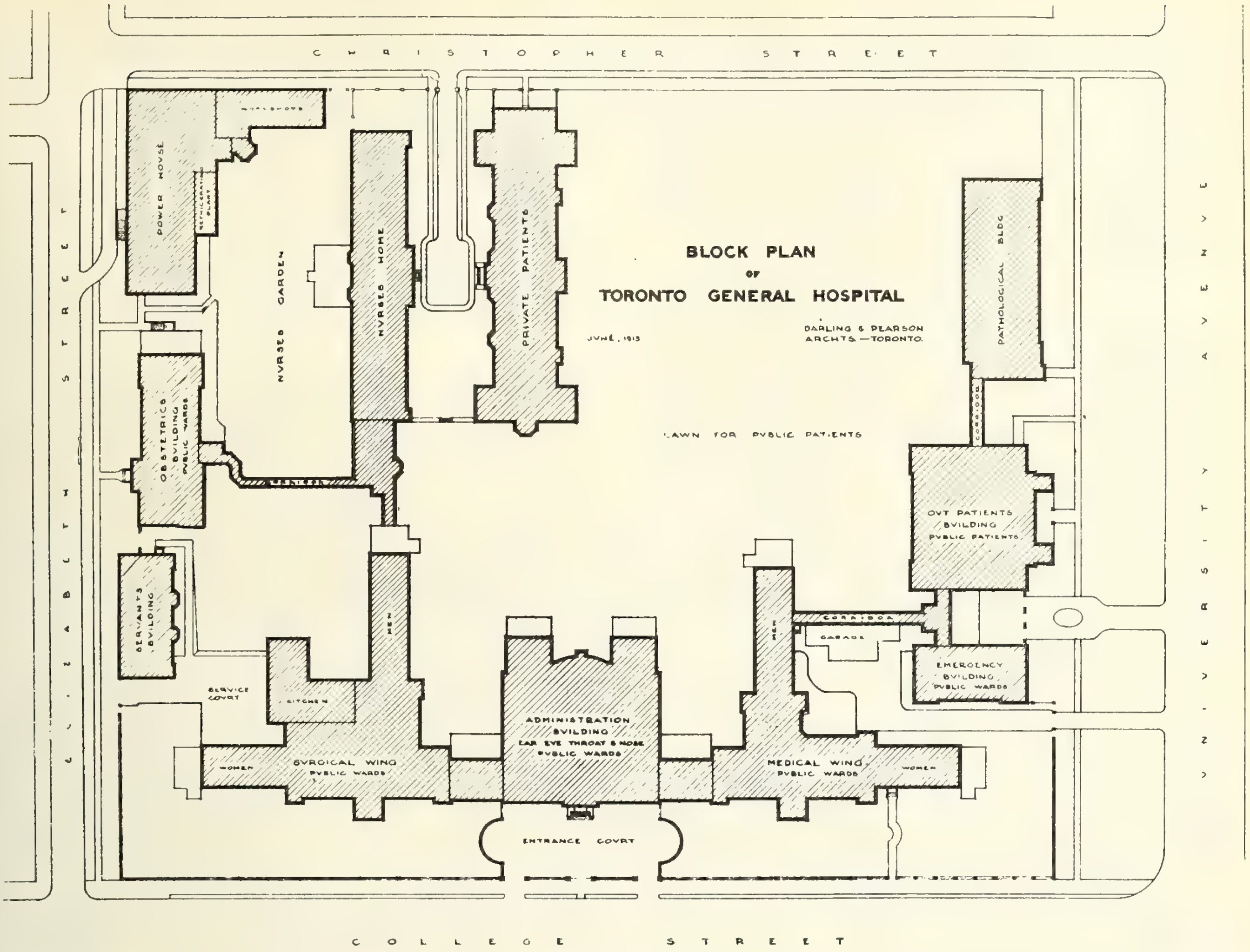
The institution, which will provide beds for about seven hundred patients, is arranged about three sides of the nine-acre square bounded by College, University, Christopher and Elizabeth streets. The main structure, comprising the administration building in the centre and the surgical building and medical departments on the east and west respectively, faces College street. This group is six hundred and twenty feet in length. The administration building, which is four storeys high, a storey higher than the adjoining surgical and medical portions, has its central situation further accentuated by an attractive main entrance and a tower executed in terra cotta surmounted by a copper dome. Extending south from the administration building are the surgical and the medical wings and south from the surgical department is the nurses' home. East of the nurses' home and facing Elizabeth street are the servants' building, obstetrics section and the power house, workshop and laundry. On the west side facing University street are the admitting department, the emergency hospital to the north, and to the south the out-patient department. This latter building, capable of affording treatment for 600 patients daily, is, because of its interior arrangement, one of the striking features of the whole group. A large central hall runs through to a skylight and the rooms on the floors are arranged cloister-like around three sides of the hall. South of the out-patient department is the large four-storied pathological building. Between the pathological building on the west and the nurses' home on the east and running north from Christopher street is the private patients' pavilion. This building, five storeys in height is practically a hospital complete in itself. Covered passageways connect all the departments except the private patients' building.

Many elements must have entered into the problem presented in determining the plan to be adopted. The relation of the group to the site, the relation of the various buildings of the group to each other, a plan that would be suggestive of the purpose, a maximum of space with reasonable expense, an internal arrangement that would centralize and facilitate internal management and produce efficiency in lighting, heating, ventilation and sanitation, and the unification of the whole, these with other factors must have been considered. The architectural plan was developed by Messrs. Darling & Pearson.

The northern facade facing College street is of free Renaissance type. Features of the general effect are the abundance of cheerful light and air and the sense of proprietorship indicated in the well-marked centre and the terminal wings, and the unity and balance of the whole. The severely plain style of the architecture has not always pleased but in



Bird's-eye view of the new General Hospital, Toronto.



an institution of this kind mere ornamentation must always give way to the utilitarian. Dr. C. K. Clarke, Medical Superintendent of the Hospital, says, "Those best qualified to speak unhesitatingly say, that 'for the purpose designed the hospital is a splendid tribute to the genius of the men who created it.'"

CONSTRUCTION DETAILS

The various buildings are fireproof throughout. The outer walls are of solid brick and the dividing walls of hollow terra cotta tile with metal lath. The floors are of concrete. The outer walls are faced with a brick especially manufactured by the Don Valley Brick Works for the purpose and trimmed with terra cotta of British make and supplied by Doulton & Company, Limited, London, Eng.

For the work of construction the Don Valley Brick Works furnished 22,000,000 bricks and 1,000,000 feet of porous terra cotta and the Dominion Bridge Company 1,350 tons of structural steel. Two kinds of brick were used, a structural wire cut and a facing brick. This latter is said to be the most expensive brick ever made in America for facing large structures. It is semi-vitreous in nature and of the dimensions of Roman brick, that is, 13½ inches by 3 inches. By the proper mixing of clays and care in firing an old gold color with deep bronze and purple flecks was produced which lends character and dignity to the whole group. The great expanse of wall if executed in stronger colors would have been trying to the eye.

In order to expedite building the masonry was divided among several contractors. Messrs. Holtby Bros., in addition to preparing the immense preliminary excavation for the main building, executed the contract for the masonry of the medical department; H. N. Dancy & Son, the administration building; Thomson Bros., the surgical wing; Witchall & Sons, the emergency and out-patients' building; R. Robertson & Sons, Limited, the pathological building; Teagle & Son, the nurses' home; Self Bros., the power house.

The roofing is felt and gravel, Messrs. Douglas Bros. furnishing, in addition to the galvanized iron work and the copper dome for the cement tower, 16,500 square feet for the administration and obstetrics buildings, and Messrs. H. Williams & Company 13,100 square feet for the private patients' pavilion, in addition to the galvanized iron and metal work of the same department. The roofing, galvanized iron, cornice work, etc., of the pathological and servants' buildings and medical wing were the work of the Forbes Roofing Company.

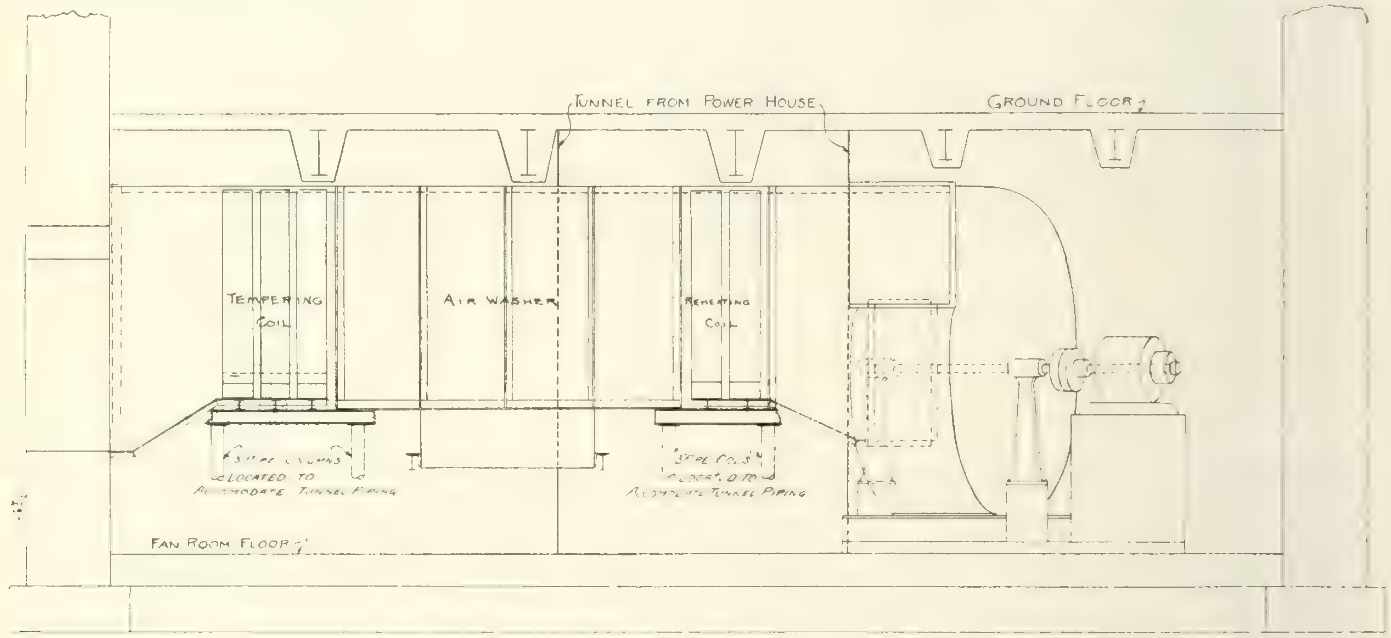
Iron Work

Ornamental and structural iron now plays an important part in the construction of all modern fireproof buildings. Much of the ornamentation, strength and safety of the new hospital depends upon the well-selected designs and the judicious use of this building material. The staircases, fire-escape stairs, frames and casements for operating windows and operating room balconies, sun porch railings and area railings, elevator cages and miscellaneous light ornamental work are all of iron work. The contract for furnishing these for the administration, private patients, obstetrics and servants' buildings, together with the surgical wing and power house, was awarded to the Dennis Wire & Iron Works Company, of London, Ont. The extent of their contract may be gathered from the fact that over a year and a half prior to the opening they had a large force of men engaged in putting in their work and that three or four months must yet elapse before their contract is completed.

The attractive and dignified fence which surrounds the new institution consists of large iron panels supported by brick pillars. The main entrance is particularly imposing the supporting pillars being of large dimensions and surmounted by lighting standards. This work was fabricated and installed by the Architectural Bronze and Iron Department of the Canada Foundry Company.

Flooring

The efficiency of a hospital depends to a very great extent on perfect sanitation and on the use of dust-resisting materials in construction. The Building Committee, intent on making this one of the best equipped hospitals, has been careful in its choice of interior finishing. All the tiling in the emergency, out-patients', medical and surgical buildings was supplied and erected by the T. Eaton Company. The entrance, receiving lobby, passages, stair landings and the many verandas are paved with Edwards red Welsh quarry tiles, which are easily cleaned and cool and restful to the eye. The floors of the operating rooms are paved with a special German white flint tile, so closely cemented that dust cannot lodge, while the walls are lined with an English white tile which does not crack even when near the intense heat which must be employed at times in the sterilizers. The whole supplies that hygienic condition which modern surgery demands. MacMullin grey Tennessee marble covers the partitions and walls of all lavatories and beautifully marked light grey Canadian marble is used for a six-foot dado in the out-patients' building. An excellent feature found throughout the structure is the sanitary junction of walls and floors. This is accomplished by means of a 6-inch cove base composed of terrazzo polished to a smooth surface. This feature is a specialty of the T. Eaton Company. The same company also furnished the "battleship" linoleum which covers the floors of the passages and corridors, 14,550 yards being used. The color is sealing wax red and was obtained after numerous experiments by the manufacturers, and very nearly approaches the shade of the Welsh tile used in other parts of the building. The linoleum is cemented to concrete floors with waterproof cement.


Tunnel from Power House
Ground Floor
Tempering Coil
Air Washer
Reheating Coil
3" Pipe Columns Located to Accommodate Tunnel Piping
3" Pipe Cols Located to Accommodate Tunnel Piping
Fan Room Floor

Section through south fan room, Surgical Building.

Wall Coatings

To increase the possibilities of cleanliness the walls have been covered with the lacquer enamel Paripan. This material has been used in some of the English hospitals, notably Guys and London. It has three qualities which make it adaptable for this kind of work. It affords lasting surfaces, is impervious to water and is easily cleaned, and is an excellent light reflector. In the corridors, wash rooms, operating rooms, etc. a glossy finish is used, while in the wards and large rooms a broken white ceiling with a light flat green frieze and glossy dado of deeper green has been employed. The woodwork specifications called for one coat of paripan filler, one of flat and two of glossy paripan. This part of the work was in the hands of Sturgeon's Limited. The plastering of the medical wing was done by W. J. Hynes, Limited.

Lighting

Indirect and semi-indirect systems of lighting are generally employed. Each ward is supplied in the centre with one or more indirect lighting fixtures of hard white enamel with silver plate reflectors and glass covers which make them dust proof. On each fixture are two or more intensities which can be manipulated with a general switch. The main entrance, dining room and the sitting room are provided with special bronze colored semi-indirect lights in classic design hanging from rods instead of chains. In the corridors are massive fixtures of spun glass with 10 and 14 inch hemispheres. The lighting fixtures were furnished by the T. Eaton Company.

Hardware

The extent and importance of the hardware contract in an undertaking of this magnitude may be readily understood when it is told that the building has 2,000 doors, 2,500 windows, 700 door transoms and 700 window transoms. The inner doors on the brick walls are hung on special 6 by 6 inch butts and the doors of the inner portions are hung on three special 5 by 5 inch butts. A master key, four tumble Yale locks with cast bronze faces, knobs, roses and key plates are used throughout the interior. All outer doors, except the main entrance, are equipped with Yale cylinder locks with outside knob solid and inside knob always free. These may be locked with the dead bolt from the inside only. The outside main entrance doors are provided with four pairs of 6 by 6 inch extra heavy cast bronze butts with cast fibre washers and Yale cylinder thumb latch and double cylinder locks.

The master key system has been carefully worked out so that the smallest possible number of keys need be carried.

The superintendent has his grand master key with which access may be had to any of the buildings. The assistant superintendent, lady superintendent, housekeeper, etc., have east a sub-master key which operates only the locks under their control. A careful record of the entire system is kept by the Yale & Towns Manufacturing Company so that any time duplicates may be made of any key from its number.

The window bolts and lifts and window transom butts and catches are of cast bronze, while the door transoms have solid bronze transom chains and catches. The 250 lavatory doors are equipped with cast bronze box flange hinges made to spring open when the doors are released by the lifting of the latch. The hardware contract was executed by the Aikenhead Hardware Company.

EQUIPMENT PROVIDED

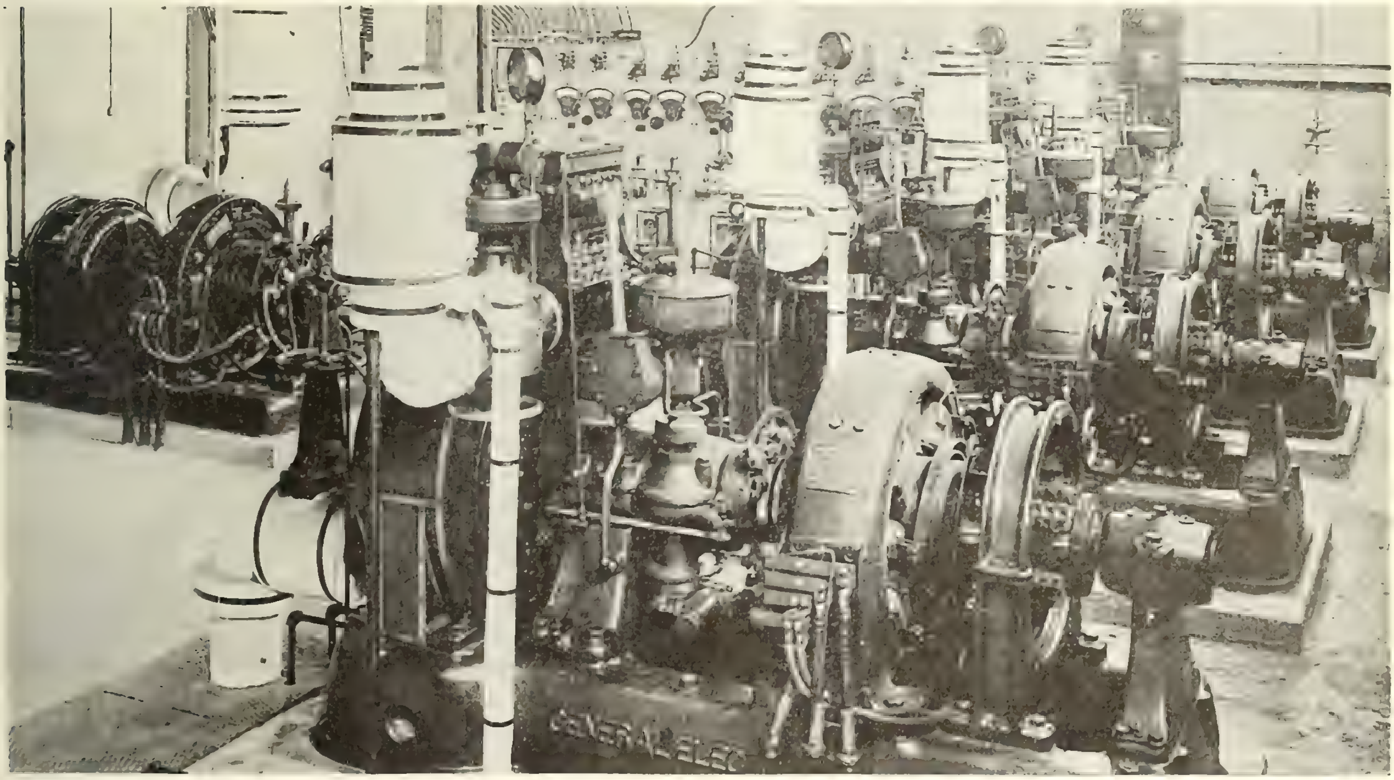
Every possible care has been taken to equip the new institution with the most recent and effective machinery and appliances in order to secure proper ventilation, a well-regulated heating system and to facilitate as much as possible the vast amount of labor involved in the management of a large hospital. This important part of the work was designed by Messrs. Williams & Cole consulting engineers, Toronto, and installed under their supervision. The efficiency of this feature will make it a model for the new hospitals built for some time to come.

Power House

The power house building is a brick and fire-proof structure 40 ft. x 136 ft. A brick wall divides the engine and boiler room. The boiler room is 68 ft. x 40 ft. with the floor set 16 ft. below the street level. The ceiling and floor of the engine room and boiler rooms are of reinforced concrete. The plant is now operating very efficiently under the management of Mr. Allan Gibson.

The boiler room contains four Babcock & Wilcox water tube boilers set in two pairs with means of access between them from front to rear. Each boiler has a capacity of 500 h.p. at a pressure of 150 lbs. The boilers are fitted with Murphy automatic stokers and Dutch oven settings. Eight tons of coal can be stored on the top of each furnace. The coal is fed mechanically to the fires by means of two 8 h.p. vertical engines, one being fixed at the extreme end of each pair of furnaces. Both natural and forced draft are used, the latter obtained by means of two steam driven, 90 in. Sturtevant fans. These are automatically regulated by a Bushnell damper regulator.

The coal is carried from the bunkers to the bins on the top of each furnace by means of an electric crane supplied by **J. T. Hepburn & Company. This crane is capable of** carrying a load of one ton. This crane and the bucket it carries is electrically operated. The same equipment removes the ashes to one end of the boiler room, from which point they are raised by a Turnbull hydraulic lift to the street level and dumped into wagons for removal. The boiler room also contains an incinerator for the disposal of refuse. This was supplied by Heenan & Froude. In this incinerator, provision is made for feeding the refuse which, in general, will be collected in special closed receptacles, through a charging door opening placed on the roof of the furnace immediately over the drying hearth. In this way the refuse will be discharged instantaneously into the furnace without the risk of its coming in contact with the operators.



Four turbo-generators in Toronto General Hospital power house—To the left a motor generator—Switchboard in background.

Generator Room

The generating equipment consists of four units of 125 kw. capacity installed by the Canadian General Electric Company. The generators are driven by Corliss non-condensing steam turbines 2,400 r.p.m. at 140 lbs. pressure. The generators are d.c. multi-pole, interpole, three-wire, 250 volt type. The generator armatures are air cooled by fans. There are two air gap commutators on each machine and the two a.c. collector rings are tapped in four places to the coils on that armature. Leads pass from the collector rings to a compensator below the switchboard and the end of each lead connects to a coil immersed in oil. From the centre of this coil a connection leads to the neutral bus, which will care for 25 per cent. out-of-balance load.

There is also installed a motor generator set of 125 kw.

capacity, the motor being three-phase, 550 volt, 25 cycles, C.G.E. type. The generator is similar to the other four, a three-wire, 250 volt machine. This will be operated by outside current in emergency.

Switchboard

The switchboard is made up of eight panels, being 5 generator panels and 3 distributing panels, which supply light and power to the various buildings. The board complete, is 20 ft. long by 7 ft. 6 in. high. Each generator panel carries two ammeters and one watt meter as well as two circuit breakers on the outside leads. The three distributing panels carry one graphic recording wattmeter. At the right of the board is the usual pair of swing voltmeters. Everything in connection with the board was supplied by the Canadian General Electric Company.

The generated power is utilized for lighting the various buildings and also for operating a large number of small motors. When the motor installation is complete, there will probably be close to 60 units, varying in size from 1 to 10 h.p., distributed at various points throughout the building. At the present time there are about 51 motors installed.

Ventilation

Ventilation is provided for by means of a system of supply fans and ducts with air washers, tempering coils and exhaust ducts and fans. A separate system is provided for the service rooms and lavatories. It is arranged to make a complete change of air throughout the building every ten minutes and in addition to this in certain of the departments the air is washed before it is allowed to enter the rooms. For example, in the surgical building there are three sets of air washing equipments and in the administration building three sets; also there is one in the operating room, two in the private patients' department, etc. The air washing sets consist of a motor-driven spraying outfit which keeps water continually sprayed over the air which a second motor, operating a fan, draws in from the outside of the building. This air, having been washed, passes up through the different rooms and is finally exhausted through roof outlets by means of fans installed in small enclosures on the roof. In all, 36 fans are used for this purpose, the sizes varying from 3 to 10 h.p.

Heating

The heating is done by both the direct and indirect method. The direct method is a system of the forced circulation of hot water piped to and from two large heating tanks in the power house. These tanks, which were manufactured by the Polson Iron Works, Limited, are 60 inches in diameter and 13 feet 2 inches and 8 feet 10 inches long respectively and are provided with steel shells and copper tubes. In the indirect method the air is warmed by passing over heated coils. Radiators of special hospital type, manufactured by the Dominion Radiator Company have been used. They have extra width between the sections and are of a plain pattern. These systems were installed in the surgical wing, administration building, out-patients' building, and emergency hospital and nurses' home by the Bennett & Wright Company, and in the medical wing, pathological building, private patients' pavilion and obstetrics' building by Messrs. Purdy, Mansell, Limited.

During the past winter the water was admitted at 182 deg. Fahr. and was returned after a circuit through the entire system within the pathological building at 181 deg. Fahr., showing that a very even heat is maintained.

In addition to the arrangements for heating the building, high pressure steam piping is carried to the diet kitchens and to the hydrotherapeutic room. This latter contains the electric light cabinet, vapor cabinet, continuous baths, showers, needle sprays, bidets and pack sinks and is located in the medical wing. These were installed by Messrs. Purdy, Mansell, Limited.

The Johnson Temperature Regulating Company have furnished the ear, nose and throat department in both the outpatients' building and the administration building with a compressed air system made up of compressors and ducts for supplying air to these rooms.

The Laundry

The laundry throughout is electrically operated. A battery of washers which operate almost continuously are belted to a shaft driven by a 10 h.p. C.G.E. motor. Two centrifugal dryers are operated respectively by 2 h.p. and 5 h.p. Crocker-Wheeler motors. The clothes are next put into a dry room tumbler operated by a 5 h.p. Crocker-Wheeler motor. The final drying is accomplished in a larger dry house through which air is circulated by means of a ¾ h.p. motor. The largest mangle is operated by a 3 h.p. variable speed Crocker-Wheeler motor. On this machine a Cutler-Hammer control is installed, and an emergency switch which stops and reverses the machine instantaneously. Three smaller mangles are each driven by ½ h.p. motors. The bodies of all these mangles are electrically heated. There is also a collar and cuff ironing machine driven by a 2/5 h.p. motor. In addition the laundry is equipped with ten large electric irons operating on 125 volts. All the motors in the building operate on 250 volts.

One of the wards coated with paripan.

Refrigeration

The cooling plant is based on the principle of refrigeration by indirect expansion. Its capacity is 17 tons of refrigeration every twenty-four hours. A brine solution is cooled by the expansion of ammonia, then by means of two Burnham pumps this solution is forced into the various refrigerators in connection with the kitchens. By the same system ice sufficient for the requirements of the hospital is manufactured daily. Large galvanized iron cans filled with water which has been distilled in a Tripure still are placed in a large tank containing ammonia coils and brine pipes and thus ice from pure water is provided for patients. This tank, which was also manufactured by the Polson Iron Company, Limited, serves as a brine reserve in the system of refrigeration.

All the main piping passes through a tunnel 9 feet by 8 feet and over a third of a mile in length. This tunnel is situated under the centre of the various buildings and at convenient points the piping for each department passes off in the direction required.

Call System

An interesting feature is the silent nurse call system. This comprises a series of annunciator cases, lamps and bull's-eyes, by means of which a patient is able to call the nurse. By pushing a button at the head of the bed a light is shown where the nurse is supposed to be at the time and also a red light is shown in the transom window of the ward. These cannot be extinguished until shut off by nurse.

Kitchen

The equipment of this large hospital kitchen, ward serving rooms, serving pantries, ice-cream and vegetable rooms was furnished by the Gurney Foundry Company, Limited, Toronto.

The apparatus was in many cases specially designed by this firm to meet the requirements of an institution of this size and character. The range for this equipment was constructed in such a manner that there are no over-head pipes, the smoke flue being specially designed beneath the floor and running to a large flue some distance away from the range.

The soup kettles, steam roasters and "upright" vegetable cookers are installed so as to do away with all escaping odors and steam, and are ventilated with a special wrought iron ventilating pipe running to the top of the main building. In this way no odors can escape to mingle with the air in any part of the building. The large ventilating hood over the entire apparatus in the main kitchen is constructed to carry off the excess heat and all odors when covers are obliged to be opened in the stock kettles, steamers, etc. This hood is connected with a large ventilating pipe which is connected to a specially designed brick ventilating flue to which is attached an electric ventilating fan of the latest type.

The Elevators

The Turnbull Elevator Company have installed eleven elevators in the hospital, all of the direct-connected electric type, the usual worm gear construction of winding machine being adopted. The principal feature of interest in connection with these elevators is the control system adopted on those operating in the medical and surgical wings. These elevators are provided with the usual car switch so that they may be operated by an attendant in the day time, and the usual signal system of annunciator connected to push buttons on the various floors is also provided. Since it was desired, however, to be able to use these elevators at night without the use of an attendant, the control system is provided with a transfer switch so arranged that when this transfer switch is moved from one position to the other, the car switch is disconnected and an automatic control comes into action.

The pressing of the button at any one of the landings which previously registered a call on the annunciator, now acts to operate the elevator itself and the car automatically travels to the floor on which the button was pressed, and stops there, unlocking the door automatically to allow the waiting passenger to enter.

A gang push button is provided in the car connected in parallel with the buttons on the various floors, and the pressing of any particular button will send the car to the corresponding floor.

An interesting feature of this control system is the means taken to protect against accident through mis-use or ignorance on the part of the person using the elevator, and to protect against interference by other parties when one person has secured the use of the elevator. Safety switches are provided on each door so that the elevator cannot operate unless all doors leading to the hatchway are closed. In addition to this a safety door lock system is provided. This system consists of a solenoid actuated cam on the car, normally extended, which unlocks the door at which the elevator car hapens to be so that a passenger may enter, but as soon as the passenger presses the button in the car or at one of the landings, this solenoid draws back and the door automatically locks itself. The solenoid remains energized whenever the car is moving, even when passing the different floors, with the result that all the doors remain locked until the car arrives at the desired floor and then only the door at that floor is unlocked. The collapsible gates on the car itself are also connected to safety switches so that a passenger cannot operate the car until these gates have been closed, thus protecting occupants from danger due to reaching out of the car in passing a floor, or kicking against the passing floors.

The person using the car is protected from interference by other parties, by the fact that all other push buttons are automatically cut off by the pressing of any one of them and the circuit established by the pressing of any button is maintained by a corresponding relay on the controller. This relay is connected to a selector, the function of which is to send the car down when the car is above the floor for which the button was pressed, and to send it up when the car is below that floor. This selector also stops the car at its arrival at the floor by opening the circuit to the reversing magnet switch.

General safety has been provided by using a potential switch, which opens the supply line to the elevator in case of drop in voltage, or if any of the ordinary safety devices operate, such as the slack cable switch which opens in case of any slackening up of the cable or crossing of cables on the winding drum, or the over travel limit switch, which would operate if the car were to run beyond the ordinary limits of travel due to failure of the ordinary operating limit switches.

City Control of Water Front

Among the interesting papers presented at the convention of the Union of Canadian Municipalities, held at Saskatoon, July 15-17, was that presented by His Worship, Mayor Oliver, of Port Arthur. In introducing his subject Mayor Oliver pointed out the difficulties involved in obtaining control in this important feature of municipal equipment. His Worship thought that there could be no difference of opinion as to who ought to control the water front, and said:

"I think that we can assume that one and all agree that from every standpoint it is beneficial to every City to have complete untrammeled control of its water front. From a scenic or landscape standpoint, from a sanitary standpoint, from a commercial and industrial standpoint there can be no opposition to civic control. Instead of this however, we find the waterfront of almost every city and town littered with the flotsam and jetsam of stream or lake; the derelicts of commerce stranded on the beach; sewers drained into the water, impurities of every imaginable character poured or dumped into the same. Docks, elevators, warehouses and boathouses are placed in positions beneficial only to the owners, while railways own the whole or the greater portion of the waterfront, which becomes a net-work of tracks and spurs. To aggravate the trouble, many streets are closed, the traffic is thus thrown on a few and conditions become dangerous. This all goes to show that in the strenuous rush for individual and corporation gain, natural beauty, scenic grandeur, landscape planning, sanitation, pure air and breathing spots have all been ruthlessly swept aside. At the same time, opportunities for civic commerce are restricted and municipal authority ignored."

After discussing somewhat fully the inconvenience caused to private individuals and the hindrance to manufacturers and shippers arising from the alienation of the water front, Mr. Oliver advanced the argument, that legislation should be obtained to allow towns and cities to expropriate and hold water lots, and when new city sites are selected there should be legislation preventing the water lots from becoming the property of individuals. We quote as follows:

"To me it seems a wrong principle that as soon as a town site is laid out and plans adopted, that the owner of land facing the shore can apply to government and receive deeds for the water lots in front thereof. I would suggest therefore, that legislation be enacted to govern all new town sites, villages, etc., hereafter established making it imperative that the government grant the municipality the said water lots under a condition that the title can never be transferred by the city to any individual or corporation. The said Legislation should also allow cities to expropriate and hold water lots already deeded subject to similar conditions. By doing so, the city can advance trade and assist industries leasing sites carefully selected so as not to interfere with any civic plan, at a good rental with a reasonable increase from time to time."

"I would further suggest that a stated case should be taken to the Dominion Railway Board and a ruling obtained to the effect that no individual or corporation can prevent any person from gaining access to the waterfront or withhold trackage or spurs where asked for when the petitioners are willing to pay for any land necessary; because a persistent refusal is a restraint on trade and injurious to the general welfare of Canada."

In closing emphasis was placed upon the value of such a body as the Montreal Harbor Commission and the assistance it lends in promoting trade and commerce, securing sanitary cleanliness and retaining the natural scenic and landscape beauty.

Canadian Railroad Development

Work will be started shortly on the construction of the new Grand Trunk station at Stratford, Ont.

Engineer Kellatt, of the Lake Erie and Northern Railway, states that it is his intention to have the line in operation between Galt and Brantford by October 1st.

It is understood that a new railway station to cost $60,000 will soon be erected at Fredericton, N.B. It will be used by the Valley Railway and Intercolonial. It is possible that it may be used by the C. P. R. also.

The following officers have been appointed to the Intercolonial Railway; Mr. F. P. Gutelius, general manager; Mr. F. B. Bady, chief engineer; Mr. C. A. Hayes, traffic manager; Mr. W. A. Duff, chief engineer of bridges.

The final accounts of the Intercolonial Railway of Canada for the fiscal year, show a net surplus of $800,000. This is about $100,000 less than the estimate of the Minister of Railways, when he made his annual statement in the House.

Mr. Charles Murphy, general superintendent of eastern lines for the Canadian Pacific Railway, has accepted the position of general superintendent of the Manitoba division, with headquarters in Winnipeg. He succeeds Mr. D. C. Coleman, who has been appointed to the Alberta division.

Clearing of right-of-way along the route of the Pacific Great Eastern Railway in West Vancouver is in progress and grading will soon be started. Grading outfits are now being conveyed to the various camp locations. Within a few weeks four hundred men will be at work along the grade.

A gap of only 38 miles now separates construction gangs along the route of the Canadian Northern Railway, working south from Alberta summit and north from Kamloops. Alberta Summit is about forty miles from Tete Jaune Cache, and construction gangs now at work there have the work well advanced along the Fraser River.

Mr. J. G. Sullivan, chief engineer for the western lines of the C. P. R. is considering the question of substituting oil as fuel instead of coal as at present used on locomotives on the Cascade division of the C. P. R. main line, between Vancouver and North Bend, and is discussing the matter with local traffic officials at Vancouver.

Officials of the Pacific Great Eastern Railway have decided to locate the North Vancouver station right at the entrance to the North Vancouver ferry landing. The building will not be a permanent structure, but will be a substantial affair nevertheless, and big enough to accommodate the local traffic passing into and out of North Vancouver when the line is completed.

The announcement was made by the Canadian Pacific Railway recently that the following new stations would be established in the western provinces: Vegreville-Calgary line, from Calgary—Rise Deer, Benyon, Redland, Rockyford, Baintree, Hawick, Lyall, Norfolk, Chestermere Lake, Barlow. Saskatoon-Calgary line, from Saskatoon—Excel, Cereal, Chinook, Dobson, Youngstown, Stanmore, Richdale and Modena.

Acting under instructions from the Transcontinental Railway Commission, the contractors in charge of the work of building the Quebec railway terminals are using every effort to complete the work by September. At present there are 350 workmen employed in the completion of the Cap Rouge railway yard, with the intention of having it ready to stretch its miles of tracks and sidings by fall, when the Transcontinental Railway is expected to be in operation to Quebec.

A new Grand Trunk route from Ottawa to Toronto is proposed in negotiations which, it is understood, have been opened up between that company and the Ottawa and New York Railway. Running rights over the latter are sought, if an arrangement can be made for standardizing the line. The Ottawa and New York Railway is owned by the New York Central, but its roadbed and rails are not in standard condition, and carrying out the proposed scheme would be contingent on improvements.

Many improvements are promised for the Intercolonial Railway. One of the first steps planned is the creation of a six-tenth grade from the city of Montreal to Halifax and Sydney and this change, it is expected, will be brought about at the rate of about one hundred miles each year. Another big improvement which is under construction is the question of double-tracking. The piece from Levis to Chaudiere, about thirteen miles, will be done this season as the money has been voted for this section.

Tenders have now been closed for the construction of portions of the Canadian Northern Pacific Railway on Vancouver Island. These include that portion from the city of Victoria to a point near Deadman's River, in the District of Esquimalt, a distance of approximately five miles; a line leaving the above at Regina avenue, Victoria, and extending to Union Bay, Saanich Peninsula, a distance of approximately 15¼ miles. Tenders to include clearing, grubbing, grading, bridges, trestles, culverts, masonry and fencing.

The plans for the St. John Valley Railway from Centreville to Andover were submitted to the provincial government of New Brunswick at a recent session. Before construction work can be commenced the approval of both the provincial and federal governments of the location plans is necessary. The contractors are now devoting themselves to the three sections between Gagetown and Centreville now under construction. These three sections, amounting to about 120 miles in all, make up more than one-half of the line, and it is believed that they will be completed this season.

The support of the provincial government in favor of a project for building a railway from Bella Coola, a port in northern British Columbia, to Red Deer, Alta., is being asked for by Mr. Edward Bath, a promoter of London, England. Mr. Bath stated that he had secured strong financial backing in England, and that survey parties have already been dispatched from Revelstoke and Ashcroft to make preliminary explorations of the route. The general direction of the proposed line will be east and west across the central portion of the province, tapping the Chilcoten, Lillooet and Big Bend districts. A charter will be asked for at the next session of the Dominion Government.

The plans of the T. & N. O. Commission provide for the reduction of the grade between North Bay and New Liskeard, and the rebuilding of nearly fifty miles of the main line and the filling of many more. The engineers who have been at work have now practically completed surveys of fills and diversion that will reduce the grade nearly by half. This will be done by diverting the line for some 35 miles north of North Bay, the most costly section of the whole plan, some $1,482,500 being required for this section. Another diversion of 6½ miles comes at Mileage 90, where the road will take a new route for four miles. Train filling will be necessary on a section totalling about ten miles running the total cost of grade reduction up to $2,263,000.

There is a possibility that the work of diverting the main line to the new G. T. P.-T. & N. O. R. Union Station at Cochrane will be completed this fall, according to a statement made by Chairman Englehart of the Temiskaming & Northern Ontario Railway Commission. Two large gangs are now at work on the laying of sidings along the main line between Cochrane and North Bay in readiness for the operation of the G. T. P. grain trains over the line. The total distance to be covered is more than 200 miles. A report on the survey for the new Nipissing Central line is nearly finished and will be in readiness by the end of the month. The Gowganda line survey is also making good progress and should see compeltion some time this fall.

Toronto's long-delayed new Union Station will be an imposing structure, one that will rank with any on the continent, according to statements made by Mr. J. W. Leonard, assistant vice-president of the C. P. R. Mr. Leonard states that Architects Ross and Jones, of Montreal, and Architect Lyle, of Toronto, are now making an inspection of the most modern railroad terminals in the United States in order to secure ideas for Toronto's proposed structure. They will return to Montreal about the end of the month, when a start on the new plans will be made. Questioned as to when a start would be made with the new C. P. R.-C. N. R. station at North Toronto, the official said that the insistence of the city of an eighteen-foot subway at Yonge street had necessitated the drafting of entirely new plans. They were, however, well on the road to completion and should be ready for publication in about two weeks' time.

Tenders for the construction of the sea wall, breakwater, ship canal and retaining wall in connection with the $25,000,000 Toronto harbor improvement scheme have been asked for by the Dominion Government. The breakwater will extend from the eastern gap to Woodbine avenue and from the western gap to the Humber River. The ship canal is to give access to the industrial district planned by the harbor board in Ashbridge's Bay. The cost of this portion of the work will be in the neighborhood of $5,000,000. It is not expected that much progress can be made with the actual work this year, but early in the spring it will be well under way.

Mainly Constructional

The News in Brief—From Coast to Coast

The town of Welland, Ont., will shortly call for tenders for sewers.

Mr. George Smith, formerly town engineer for Lindsay, Ont., has been appointed town engineer for Midland, Ont.

The city of Toronto has decided to enlarge its civic plant for street paving sufficiently to take care of all the paving work of the city.

Building permits for the first six months of 1913 at Sydney, N.S., total $186,793, as against $254,616 for the corresponding period of last year.

A $6,250,000 hotel is to be built on the site of St. George's Hospital, London, Eng. The area purchased is an acre and three-quarters and cost $1,300,000 an acre.

The United Typewriter Company, Toronto, will erect a ten-storey building on their property on Lombard street. The cost will be between $125,000 and $150,000.

The formal signing of the contract for the new Parliament Buildings at Winnipeg took place recently and as soon as the contractors can organize their forces work will be begun.

The permit for the erection of the 10-storey million-dollar building of the Dominion Bank at King and Yonge streets, Toronto, was issued by the City Architect's office.

Work started recently on the construction of the plant of the Imperial Iron and Steel Company at Prince Albert. This company will employ four hundred men within fourteen months and will mill 3,000 tons of iron per month.

The contract for the building of the Longue Pointe School at Montreal was awarded to Mr. F. Henri Demers at a recent meeting of the Catholic School Commissioners, the Board deciding to accept the lowest tender, $196,000.

Building permits for the first six months of 1913 at St. John, N,B., amounted to $1,184,194, an increase of no less than 283 per cent over the same period of 1912, which is a far larger percentage than can be shown by any other city in the Dominion.

The Canadian Municipalities convention will be held in Sherbrooke, Que., in 1914. Officers elected for the year ensuing are: President, F. P. Bligh, Mayor of Halifax; first vice-president, C. M. R. Graham, Mayor of London, Ont; second vice-president, F. H. Herbert, Sherbrooke; third vice-president, F. E. Harrison, Mayor of Saskatoon; hon secretary-treasurer, W. D. Lighthall, K.C., ex-Mayor of Westmount, Que. (re-elected).

The contract for the new Government drydock at Levis was awarded by the Cabinet Council to Messrs. M. P. Davis & Son. The cost is approximately $2,600,000. The drydock will be one of the largest in the world, and will provide accommodation for the repair of the largest ocean liners, thus meeting a long-felt want in connection with the St. Lawrence route. Construction will begin at once, and it is hoped to have the dock in operation for the season of 1915.

The committee of works of the city of Toronto recently adopted the following recommendations of Works Commissioner Harris. One is the extension of Wilton avenue, from Bolton avenue to Coxwell avenue. This will necessitate a subway at the G. T. R. tracks at Logan avenue. The cost will be $570,000, of which 18 45-1000 per cent. will be paid by the property owners. The other work is the grading of Bathurst street, between the C. P. R. and Nina street. This will cost $225,000, of which property owners will pay 28 85-100 per cent.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Waterworks, Sewerage and Roadways

Amherst, N.S.
Waterworks extension, Agnew St., for Town Council. Clerk, W. F. Donkin. Engineer-in-charge, J. H. Hamilton.

Blenheim, Ont.
Cement walks for Town Council. Mayor, S. Edmonds. Clerk, P. S. Shillington. New walks on Marlboro, Victoria, Jane, Little and Catharine streets.

Downie Twp., Ont.
Cement culverts for Twp. Council. Tenders will be received by Clerk, Peter Smith, 25 Elizabeth St., Stratford, after July 20th, for culverts on Concessions 3, 10, 11, 6, 7, 8, 9, and gore. Specifications at office of Clerk.

Dover Twp., Ont.
Drainage for Twp. Council. Clerk, John Welsh, Chatham, Ont. Tenders received by Clerk until July 31st, for dredging about 9 miles drainage work in above Township.

Montreal, Que.
Concrete pipes, Notre Dame, for Board of Commissioners, c/o L. N. Senecal, Secretary, City Hall. Required, 2 x 3 pipe, 500 lin. ft.; 24 x 30 x 60 ft. lin; manhole shafting, 36-in. diam. sewer 1,300 lin. ft.; 42-in. diam., 1,200 lin. ft. Engineer, Major Howard, Sewer Dept., City Hall. Plans and specifications at office of Purchasing & Sales Agent. Tenders received by Secretary until July 24th.

Sewers, pavements, etc., for Board of Commissioners. Secretary, L. N. Senecal. At meeting of Council the following amounts were voted on new sewer construction, $56,350; preliminary work for Cartier Monument, on Mount Royal Park $2,000; fitting up playgrounds on Gallery and St. Patrick's Square $2,635. Installation of water pipes on certain streets, $75,000; construction of sewer on Bois de Boulogne ave., $2,000; construction of pavements and sidewalks on Cote St. Paul Rd., $53,000; continue work of covering in St. Pierre River, $94,250; fireproofing low level stations, $12,500; leveling of Bouce street, $7,000.

Paving for Board of Commissioners. Secretary, L. N. Senecal. Engineer, Geo. Janin, City Hall. Tenders will shortly be called for.

Sewers for Board of Commissioners. Secretary, L. N. Senecal. Engineer, Geo. Janin, City Hall. Tenders will be called for shortly.

Road work, Lachine, for Town Council. Sec.-Treas., H. Charette. Alphonse Laplante's tender for sand at 80 cents per cu. yd. was accepted but contract will not be awarded until money market improves.

Ottawa, Ont.
Pavements for City Council. Mayor, J. A. Ellis. City Engineer, Archibald Currie. Asphalt pavements on McLaren, Bank to Elgin; Lister, Bank to Bronson; Arlington, Bronson to Bell.

Paving. Council is contemplating placing all streets in city in good condition. Material, asphalt, wood block, tar macadam, tarvia, macadam. By-law will be submitted to ratepayers. Mayor, J. A. Ellis. Engineer, Archibald Currie.

Point Grey, B.C.
Sewer. The Council will receive tenders till 5 p.m., July 28th, for an 8-in. diameter sewer from the existing sewer near Laurel street along 18th ave. to the lane in Block 536 D.L. 472, approximately 400 lin. feet. Clerk, G. G. Heighway, Municipal Hall, Kerrisdale, B.C.

Port Arthur, Ont.
Additions to sewer system for City Council. Commissioner of Utilities, J. J. Hackney. By-law has been passed by ratepayers.

Park improvements for City Council. Commissioner of Utilities, J. J. Hackney. By-law has been passed by ratepayers.

Sidewalks for City Council. Commissioner of Utilities, J. J. Hackney. By-law has been passed by ratepayers.

Toronto, Ont.
Paving, etc., cost $25,000, Humber Blvd., for R. Home Smith and Board of Control. Parks Committee approved $16,000 widening and paving from Lake Shore North; $7,000 widening and paving section of Bloor St.; $2,000 planting trees, etc.

Street extension for Board of Control. Mayor, H. C. Hocken, City Hall. Extensions, Earl St., $40,000; Wilton Ave. from Bolton to Coxwell, $570,000, will include subway at Logan Ave. Grading Bathurst St. from C. P. R. to Nina St., $225,000. Passed by Works Committee July 14th.

Twp. Tilbury West, Ont.
Drainage, cost $3,248, for Twp. Council. Clerk, S. T. Anderson, Comber, Ont. Engineer-in-charge, J. J. Newman, C.E., Windsor. By-law will be voted on July 26th.

Victoria, B.C.
Water main for City Council. Water Commissioner, C. H. Rust. Consulting Engineer, Wynn Meredith. Tenders received by Water Commissioner until July 31st, for the fabrication and laying of 10½ miles of 36 in. rivetted steel pipe and appurtenances on the line of the Sooke Water Supply pressure conduit. Specifications prepared by Consulting Engineer. Plans, etc., at the Sooke Water Supply Office, 1414 Douglas street.

Winnipeg, Man.
Sewers for Board of Control. Secretary, M. Peterson. Engineer, H. N. Ruttan, 223 James ave. Tenders received by Board of Control until July 14th for sewer in Cathedral ave. from Parr street to W. line Lot 31, Bl. 1.

Water mains for Board of Control. Secretary, M. Peterson. Engineer, H. N. Ruttan, 223 James ave. General contract awarded to Engineer of Construction for water mains in: Cathedral ave., McKenzie street, Anderson, Bannerman, Main, Prince, Artillery, Battery, Mortimer Pl., St. John's ave., Athole ave., $2,488.80.

Sewers for Board of Control. Secretary, M. Peterson. Engineer, H. N. Ruttan, 223 James ave. General contractor, Dominion Construction Co., 290 Selkirk ave., for sewer to Ethelbert street, at $366.50; William Warrack for sewers in Canora street and Ida ave., at $804.

Watford, Ont.
Waterworks for Town Council. Clerk, W. S. Fuller. By-law has been voted on.

CONTRACTS AWARDED

Ft. William, Ont.
Sewer, Stanley St., for City Council. Mayor, Geo. Graham. Engineer, John Wilson. General contractors, Flanagan & Murphy.

Montreal, Que.
Roadway, to Quebec, for Prov. Govt. Dept. of Public Works. Minister, Hon. L. A. Taschereau, Quebec. Sec., Alphonse Gagnon. General contractor, H. Beauregard, 70 St. James St. General contractor is calling tenders for part of the work. 150 miles macadam roadway, crushed stone required.

Sewers for Board of Commissioners. Sec., L. N. Senecal. Engineer, Geo. Janin, City Hall. The following contracts have been recommended, Harris Cons. Co., 120 Sanguinet St., main sewer, $140,000; Henault & Heffernan, 692 Church Ave., Verdun, 2nd section, $156,437; main sewer, Notre Dame de Grace, F. O. Sullivan, c/o Sec. Sewer Dept., City Hall. 4th sec., $78,940; Zenon Corbeau, 2502 Ave. de Chateaubriand, 5th sec., $109,857; F. Dillon, Alice St. to 29th Ave., $32,350; F. Dillon, Rosemount Blvd., $22,434; Henault & Heffernan, 692 Church Ave., Verdun, Mountain St., $9,571; Salvator Ricci & Co., 1753 Ave de Chateaubriand, Contrecoeur, $15,247; Berri St., $16,875; Gilbert Paye & Co., c/o Sec. Sewer Dept., City Hall, Rosemount and Delorimier, $61,545; Bordeaux and Descarrieres, $4,493; Henri Bertrand, 2727 St. Hubert St., several tenders ranging from $740-3,324.

Pumping station, cost $30,000, Commissioner, for City of Montreal. Engineer, Geo. Janin. Builders, Gilbert, Paye & Co., 2065 Ave de Chateaubriand. One storey (5o ft.), 30 x 65, cement foundation, reinforced concrete and brick construction.

Simcoe, Ont.
Sewerage pumping machinery, cost $1,410, for Town Council. Clerk, W. C. McCall. General contractors, Canadian Fairbanks-Morse Co., Ltd., 26 Front St. W., Toronto.

Granolithic sidewalks for Town Council. Clerk, W. C. McCall. General contractor, J. B. Osborne, at 10c. per foot.

Railroads, Bridges and Wharves

Greensville, Ont.
Concrete dam, cost $5,000, Dundas Creek, for Dundas Water Commission, Dundas. Architects, McPhie, Kelly & Darling, Bank of Hamilton Bldg., Hamilton. Work is held up for better arrangements.

Grantham Twp., Ont.
G. T. Rly. Co. has been authorized to construct siding for Canadian Canners, Ltd., on Lot 20, Con. 2.

London, Ont.
Bridge, cost $25,000, Wharncliffe Road, for City Council. Mayor, C. M. R. Graham. Chairman Board of Works, B. W. Bennett. Engineer, W. N. Ashplant. Tenders addressed to Chairman No. 2 Committee, received until July 31st, for substructure of highway bridge over Thames River, 2 plain concrete piers, 2 reinforced concrete winged abutments containing about 620 cu. yds. concrete and 17,000 of steel reinforcements.

Montreal, Que.
Pier extension for Harbour Commissioners, c/o Mr. Cowie, Chief Engineer, 57 Common street. Extension to King Edward Pier, 250 x 300, concrete. Queen Alexandra, 250 x 300, concrete; Jacques Cartier, 250 x 300, concrete. To be built by Commissioners next spring.

Ottawa, Ont.
Bridge for Can. Northern Ontario Rly. Chief Engineer, A. F. Stewart, Toronto St., Toronto. Permission granted to construct bridge across Little Sturgeon River, Twp. Beaucage, Ont., mileage 243.5 from Ottawa.

St. John, N.B.
Rebuilding wharf, North Wharf, for City Council. Commissioner, H. B. Schofield, City Hall. Engineer, Geo. N. Hatfield, City Hall. Wooden wharf to be replaced by concrete or granite structure.

Toronto, Ont.
Painting bridges for Board of Control. Mayor, H. C. Hocken, City Hall. Specifications at office of Railway and Bridges Dept. Tenders received by Mayor until Aug. 5th, for painting bridges, North Glen Road, St. Clair Ave., over Vale of Avoca, Wallace Ave. footbridge over R. R. Tracks.

Harbor Improvement for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa, Ont. Tenders received by Sec., until Aug. 25th, for construction of sea wall, breakwater, ship channel and retaining wall. Plans at offices of J. G. Sing, Toronto, Harbor Commissioner's office., 76 Adelaide W., Toronto; H. J. Lamb, Dist. Engineer, Windsor, and J. L. Michaud, Dist. Engineer, Post Office, Montreal, Que.

Winnipeg, Man.
C. P. Rly. Co. has been authorized to construct bridge across Red River on its Kildonan Branch.

CONTRACTS AWARDED

Bay Fortune, P. E. I.
Bridge, cost $7,000, for Prov. Govt. Dept. of Public Works. Sec., L. B. McMillan, Charlottetown. Engineer-in-charge, H. H. Shaw, Charlottetown. General contractors, W. P. McNeill & Co., New Glasgow, N.S. Two span, 120 x 15, steel construction.

Breadalbane, P. E. I.
Bridge, cost $1,400, for Prov. Govt. Dept. of Public Works. Sec., L. B. McMillan, Charlottetown. Engineer-in-charge, H. H. Shaw, Charlottetown. General contractors, W. P. McNeill & Co., New Glasgow, N.S. One span, 60 x 15, steel construction, contracts for 6 smaller steel bridges in various parts of the country have been awarded to Messrs. McNeill & Co.

Emerald, P. E. I.
Bridge, cost $1,200, for Prov. Govt. Dept. of Public Works. Sec., L. B. McMillan, Charlottetown. Engineer-in-charge, H. H. Shaw, Charlottetown. General contractors, W. P. McNeill & Co., New Glasgow, N.S. One span, 50 x 15, steel construction.

Gravenhurst, Ont.
Concrete dam, cost $5,000, South Falls, for Elec. Light & Water Commission. Chairman, W. J. Stubbs. Engineers, Bowman & Connor, 36 Toronto St., Toronto. General contractor, W. G. Gibson, Port Hope.

Moorefield, Ont.
Bridge (Booth Bridge) for Twp. of Maryboro. Clerk, R. McArthur. Steel, Ontario Bridge Co., Crown Office Bldg., Toronto. Abutments, Pipe & Clemens, Berlin, 69 x 16, 1 span, concrete abutments.

Mink River, P.E.I.
Bridge, cost $3,000, for Prov. Govt. Dept. of Public Works. Sec., L. B. McMillan, Charlottetown. Engineer-in-charge, H. H. Shaw, Charlottetown. General contractors, W. P. McNeill & Co., New Glasgow, N.S. One span, 100 x 15, steel construction.

Prov. of Quebec
Bridge, cost $3,500, over Mill Hill Brook, for Council of Valcartier. Sec.-Treas., Thos. Lavallee. Engineer, L. A. Vallee, Que. General contractors, Donohue Construction Co., Quebec.

Peterboro Co., Ont.
Three bridges for County Council. Clerk, E. M. Elliott, Peterboro. Engineer-in-charge, J. G. Belcher, C.E., Peterboro. General contractors, Dickson Bridge Co., Campbellford, Ont.

Wilmot, P.E. I.
Bridge, cost $2,000, for Prov. Govt. Dept. of Public Works. Sec., L. B. McMillan, Charlottetown. Engineer-in-charge, H. H. Shaw, Charlottetown. General contractors, W. P. McNeill & Co., New Glasgow, N.S. One span, 70 x 15, steel construction.

Public Buildings, Churches Schools, etc.

Battleford, Sask.
Public building, for Dom. Govt. Dept. of Public Works. Tenders received by Sec., R. C. Desrochers, Ottawa, until 4 p.m. July 31st. Plans, specifications, etc., may be obtained at the offices of J. E. Cyr, Supt. of Public Bldgs. for Manitoba, Winnipeg, Man.; W. T. Mollard, Clerk of Works, Regina, Sask., and at office of Sec. and at Dom. Govt. Telegraph Office, Battleford.

Baie Des Febvres, Que.
School, cost $125,000, Yamaska County, for R. C. School Commissioners, Baie des Febvres. Architect, A. Trudel, 15 St. Philippe St., Montreal. Four stys., 64 x 82, cement foundation, brick construction. Architect will soon call for tenders.

Cartierville, Que.
Rest home, cost $60,000, for Rest Home Committee, c/o R. P. Recteur, Rachel E. and Papineau Ave., Montreal. Architect, L. R. Montbriand, 230 St. Andre St., Montreal. Mason, M. Prousse. Brick, Jos. Monette, 351 Sanguinet. Painting Cesaire Despatie, 2719 St. Hubert. Architect not yet sure whether to use stone or brick. Three storeys and basement, 65 x 150, stone foundation, stone and brick construction. Tenders called shortly for roofing, carpenter and electrical work.

Edmonton, Alta.
Laundry and power house, cost $45,000, for Misericordia Hospital, 12th street & Victoria ave. Architect, H. Percy Banie. General contractors, Cannell & Spencer Construction Co., 427 Jasper ave. W. General contractors are doing practically all the work themselves. To be finished by Sept. 1st, 1913. Two storeys, 40 x 98.

Montreal, Que.
Catholic Y. M. C. A., cost $10,000, St. Dominique near Mile End Station, for Rev. Emile Piche, Bernard and Waverly. Architects, Gauthier & Daoust, 180 St. James street. General contractor, painting and concrete, T. Lessard, 210 Park. Carpentry, Lebel & Forgues, St. Urbain and Van Horne. Iron and steel, Dom. Bridge Co., Lachine. Roofing, heating, plumbing and electrical work, Blanchard & Son, 2168 St. Lawrence. 3-storeys and basement.

Church, cost $200,000, 401 Centre St., for St. Charles R. C. Church Parish, c/o Rev. A. Lacosse, 401 Centre St. Architects, Macduff & Lemieux, Merchants Bank, St. Catherine W. 65 ft., 100 x 100, stone foundation, Montreal stone, structural steel and brick construction. Plans prepared.

Church, cost $30,000, Pius IX., for Hochelaga Methodist Church. Pastor, Rev. Isaac Nelson, 80 Chambly. Architect, A. G. Nosworthy, 814 New Birks Bldg. 30 x 60, cement foundation, brick construction. Plans in progress.

Royal George school, Notre Dame De Grace (Church and Girouard), for Protestant School Commissioners of N. D. G. West, c/o Mr. S. Duncan, 737 St. Catherine W. Architect not chosen. Two stys. and basement, 100 x 60, cement foundation, concrete and brick construction.

Church, for St. Colomba's Congregation, c/o Rev. J. A. Osborne. Architect not chosen. Architect to be chosen before Xmas, plans drawn and work started in Spring of 1914.

Alterations to City Hall, cost $10.000, Longueuil (St. Charles), for Town of Longueuil. Architect, Alf. Prefontaine Mason, Telesphore Narboune. Carpenter, Emery Verronneau. Iron and steel, American Locomotive, Maisonneuve. Painting, roofing, heating, plumbing, electrical and interior fittings not let yet. Three storeys, cement foundation, brick construction.

Medicine Hat, Alta.
Hospital for R. C. Church, Father Cadoux. Mr. E. D. Bennett, Toronto St., will donate site for hospital on Block 16, Crescent Heights sub-div. providing

building is commenced within the present year.

Nelson, B.C.

Hospital, cost $78,000, for Kootenay Lake General Hospital. Sec., Geo. Johnstone. Directors, J. A. Irving, Edward Kerr, Geo. F. Motion, all of Nelson. Architect, Alex. Carrie. Accommodation for 55 patients, ice-making plant to be installed to produce 192 lbs. of ice every 14 hours.

Port Arthur, Ont.

Stores and offices, cost $425,000, for Jas. Whalen & Co. Architects, Brown & Vallance, 32 Canada Life Bldg., Montreal. General contractors, Canadian Stewart Co., head office, Montreal. Terra cotta, Atlantic Terra Cotta Co., New York. Granite, John Swenson Granite Co., c/o General contractors. Seven storeys, 100 x 90.

Regina, Sask.

Jewish synagogue, Ottawa St., Blk. 361, for House of Jacob. President, S. Pearlman, Broad and 10th Ave. Plans, specifications, etc., obtained from President who will receive tenders for the erection and supply of material. Brick and frame construction.

Addition to hospital for City Council (Hospital Board). Architect, N. R. Darrach. City Commissioner, L. A. Thornton has been asked to call for tenders for addition of new wing to present building.

Church, cost $50,000, for Methodist Church, 14th Ave. and Rae St. Architects, Clemesha & Portnall, Scarth St. Brick, stone and artificial stone construction. Plans ready.

St. Anne de Bellevue, Que.

Church, cost $25,000, for Union Church Congregation. Architects, Peden & McLaren, 20 St. Alexis street, Montreal. General contractor, masonry, carpentry, roofing, painting, S. W. Hamilton, 402 Bleury street. Heating, plumbing and electrical work, Westmount Plumbing & Heating Co., 4278 St. Catherine West.

Sudbury, Ont.

Public building for Dominion Govt., Dept. of Public Works. Tenders received by Secretary, R. C. Desrochers, Ottawa, Ont., until Aug. 6th. Plans at Post Office and Station "F," Yonge St., Toronto.

Whitby, Ont.

Addition to House of Refuge for County Council. Supt., Dr. Lavery, Whitby. Tenders for work and materials received by Clerk, C. E. Farewell, Whitby, until August 2nd. Further particulars from Supt. or Clerk.

West Lorne, Ont.

Post office, cost $25,000, for Dom. Govt. Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa, Ont. Plans being prepared.

CONTRACTS AWARDED

Amherst, N.S.

School addition, cost $30,000, Acadia St., for Town Council. Architect, W. M. Mitchell. General contractor, J. E. Lusby. Two storeys, extension 4 rooms to present building also an assembly hall, stone foundation, red limestone and brick construction.

Burquitlam, B.C.

Church for Burquitlam Anglican Church, Cameron St., off North Road. General contractors, Bowden Cons. Co., Burnaby, B.C.

Blackfoot Indian Reserve, Alta.

Boarding school for Dom. Govt. Dept. of Indian Affairs. Sec., J. D. McLean, Ottawa. General contractor, F. L. Davis, Calgary.

Burnaby, B.C.

Manual training school, cost $3,675, for Public School Board. Architect, J. H. Bowman, Crown Bldg., Vancouver. General contractors, F. P. Rogers, Vancouver. Frame construction.

Collingwood, Ont.

Post office, cost $108,000, Hurontario, for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa, Ont. General contractors, Healy, Herrington & Bryan, Collingwood.

Charlottetown, P. E. I.

Rebuilding church, cost $200,000, for St. Dunstan's R. C. Cathedral. Rector, Rev. G. J. McLellan. Builders, John S. Metcalf Co., Ltd., 34 St. Francois Xavier St., Montreal. Foreman of Co., Mr. Hodge.

Calgary, Alta.

Police station, cost $16,000, for City Council. Architects, Lang & Mayor, Board of Trade Bldg. General contractors, Thomas McKenzie & Jamieson. Trussed Concrete Steel Co. have secured the contract for the Kahn System of reinforcing. Four storeys, 75 x 100.

School, cost $185,000, for School Board. Building Supt., H. McClelland. General contractor, R. A. Brocklebank, 9 Bell Block. Concrete, Foster Cartage Co., 14th Ave. W. Brick, reinforced concrete and sandstone construction.

Edmonton, Alta.

Public school, cost $4,000, Richard, for Public School Board. Sec., M. Brady. Architect, G. E. Turner, Mortlake Block. General contractor, N. Cuthburtson, 113 8th St. Edmonton S. Two storeys, 26 x 37, frame construction, brick foundation.

South Edmonton, Alta.

Church, cost $32,000, 2nd Ave. N. and 3rd St. E., for the Anglican Church Congregation. Pastor, Rev. C. Carruthers, 15 3rd St. E. Architect, Mr. Gibb, Imperial Bank Bldg. General contractors, Read, MacDonald & Brewster, 619 4th St. One storey, 120 x 60, structural steel construction.

School, cost $150,000, King Edward Park, for Public School Board. Sec., M. Brady. Architect, G. E. Turner, Mortlake Block. General contractors, Read, MacDonald & Brewster, Teglar Block. Two storeys, 115 x 164, 17 rooms.

Hamilton, Ont.

School, cost $136,000, Cannon St. E., for Board of Education. Secretary, R. H. Foster. Architect, A. W. Peene, Clyde Block. General contractor, W. H. Yeates, 24 Leeming street.

Addition to school, cost $5,000, Dundas Road, for Twp. School Board. Architects Eastrick & Son, 30 King St. E. Mason, Wm. Aldridge, 28 Hunt St. Carpenter, John Mills, 167 Herkimer St. Roofing, M. V. McLean, 314 Hess St. S. Painting, C. King, 32 Caroline N. One storey addition, 67 x 40, brick construction.

London, Ont.

Alterations to civic offices, cost $6,000, Dundas, for City Council. Mayor, C. M. R. Graham. Engineer, W. N. Ashplant. Roofing, Philip Carey Co., $255. Vault doors, Ford & Featherstone, $55.

Medicine Hat, Alta.

Church, cost $90,000, for R. C. Church, Priest, Father Cadoux. Architect, M. N. Cutter, c/o Father Cadoux. General contractors, Purdy Anderson & Co., Montreal. One storey, 152 x 54, reinforced concrete construction.

Montreal, Que.

School, cost $196,000, Longue Pointe (Lavaltre), for R. C. School Commissioners. U. Lafontaine Com. Academy, 85 St. Catherine W. Architect, Z. Trudel, 238 St. Andre, Montreal. General contractor, H. Demers, 47 Labelle. 4 storeys, 70 x 130, cement foundation, Indiana limestone, terra cotta and structural steel construction.

Alterations to City Hall, cost $10,000, Longueuil (St. Charles), for Town of Longueuil. Architect, Alf. Prefontaine. Mason, Telesphore Narboune. Carpenter, Emery Verronneau. Iron and steel, American Locomotive, Maisonneuve. Painting, roofing, heating, plumbing, electric and interior fittings not let yet. Three storeys, cement foundation, brick construction.

Portage la Prairie, Man.

Boarding School and Hospital for Dominion Government, Dept. Indian Affairs. Secretary, J. D. McLean, Ottawa. General contractors, Sydney Bros.

Regina, Sask.

Fair building, cost $120,345, for City Council. City Clerk, A. W. Pool. Architects, Storey & Van Egmond, Credit Foncier Bldg. General contractors, Parsons Construction & Engineering Company, Limited, Scott street, at $102,000. Heating and plumbing, Potts & Smith, Cornwall street, at $18,345.

Two grand stands, cost $30,000, for City Council. Manager of Grounds, D. T. Elderkin, 201 Donahue Block. General contractor, H. Traub. Frame construction, seating, offices, dining room, etc.

Twp. North Grimsby, Ont.

Public school, cost $8,500, for Trustees S. S. No. 3. Secretary, W. E. Smith, Grimsby. Architect, Joseph Daw, 165 St. Paul street, St. Catharines. Masonry and plastering, G. Nigh, Grimsby. Carpentry and roofing, D. Marsh & Son, Grimsby. Steel, Hamilton Steel Construction Co., Hamilton. Painting, G. Haist, Grimsby. Heating and plumbing, W. Walker, Grimsby. Electrical, Martin Elec. Co., St. Catharines.

Toronto, Ont.

Addition to school, cost $33,087, Pape ave., for Board of Education. Secretary, W. C. Wilkinson. Masonry, Steel and fireproofing, G. T. Gayton, 2 Wayland ave., $12,445. Carpentry, A. Williamson, 44 Badgerow, $12,850. Plastering, John Jackson, 583 Concord, $2,000. Painting and roofing, J. T. Flowers, 5 Denison ave., $2,500. Iron stairs, Shipway Iron B. & W. Co., 773 King W., $3,292.

Addition to school, cost $29,227, McMurrich, for Board of Education. Secretary, W. C. Wilkinson. Masonry, steel and fireproofing, G. T. Gayton, 2 Wayland ave., $11,400. Carpentry, Crocker & Ledrew, 185 Ossington, $11,753. Plastering, Geo. White, 688 Kingston Rd., $2,100. Painting, J. Phinnemore, 455 Yonge street, $1,032. Roofing, J. T. Flowers, 5 Denison ave., $1,559. Iron stairs, Can. Ornamental Iron Co., 88 River, $1,383.

Addition to school, cost $43,780, Deer Park, for Board of Education. Secretary, W. C. Wilkinson. Masonry and steel, J. A. Wickett, 28 Toronto street, $19,449. Carpentry, F. Armstrong, 89 Oak street, $19,264. Plastering, John Jackson, 583 Concord, $1,850. Painting, Taylor & Co., 9 Bloor E., $1,730. Roofing, J. T. Flowers, 5 Denison ave., $1,487.

Sanitarium, Weston, for National Sanitarium Assn. Sec.-treas., R. Dunbar, 247 King W., Toronto. Architects, Dennison & Stephenson, 20 King West. Masonry, Davidge & Lunn, 684 Bathurst. Carpentry, Geo. Henry, 153 Rusholme Rd. Steel, McGregor & McIntyre, Pearl street. Roofing, Forbes Roofing Co., 91 Spadina ave. Plastering, W. J. Hynes, 718 Dupont street. Painting, J. J. Brennan, 260 Shaw street. Three stys. addition to main wing, steel and brick construction.

Victoria, B.C.

Observatory Bldg., Gonzales Heights, for Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractor, G. C. Hurrell, Victoria.

Winnipeg, Man.

Parliament Bldgs. for Prov. Govt., Dept. Public Works. Acting Minister, G. R. Coldwell. Architect, F. W. Simon, 260 Fort street. General contractors, Thos. Kelly & Sons, 200 Nanton Bldg., for $2,859,750.

College for Manitoba Medical College, Winnipeg. Architect, E. W. Crayston, 572 Ross ave. General contractors, masonry and carpentry, Blow Bros. Iron and steel, Vulcan Iron Works, Point Douglas ave. Roofing, A. B. Ormsby Co., 677 Notre Dame. Painting, R. Crawford, 118 Sherbrooke street. Heating, G. L. Stephenson, 842 Sherbrooke street. Electrical, Wm. McDonald & Wilson, 309 Fort street.

Law courts for Prov. Govt., Dept. of Public Works. Acting Minister, G. H. Coldwell. Prov. Architect, V. W. Horwood, 261 Fort street. General contractors, The National Construction Company, Donalda Bldg. Structural Engineer, C. A. Turner, Canada Bldg. Plumbing, Crane & Ordway Co., 93 Lombard, at $119,000.

Business Buildings and Industial Plants

Brighton, Ont.

Factory. Tenders received by Architect, W. A. Mahoney, O. A. A., Guelph, Ont., until July 28th. Plans, etc., at office of architect and Geo. Drewery, B.A., Brighton. Owner's name withheld.

Fort William, Ont.

Warehouse, for A. MacDonald Co., 116 Market St. E., Winnipeg, Man. Plans are being revised by M. H. Braden, Ft. William. Three storeys, 101 x 66.

Hamilton, Ont.

Alterations to store, cost $5,000, York street, for Duff Stores, Ltd. Architects, Watt & Blackwell, Lister Chambers. Plans ready.

Store, cost $5,000, King, for B. H. Webster, Wentworth & King streets. Architect, F. W. Warren, 808a Bank of Hamilton Bldg. Marquee will be built. One storey, 24 x 80, pressed brick construction.

Ladysmith, B.C.

New Western Hotel Co. contemplate addition to hotel to cost $12,000.

Montreal, Que.

Theatre, cost $45,000, St. Lawrence and Duluth, for Solomon Vineberg, 316 Notre Dame St. W. Architect, C. Dufort, 632 St. Hubert street. Three stys., 30 x 96, cement foundation, stone, terra cotta, structural steel and brick construction. Tenders received by architect and owner after July 21st.

Hotel, cost $60,000, Lachine, for Hudon & Orsali, 259 St. Paul street, Montreal. Architect, J. O. Turgeon, 55 St. Francois Xavier. Four storeys, 50 x 100, cement foundation, structural steel and brick construction. Plans ready.

Shoe factory, cost $11,000, Carriere, for British Construction Co., 238 St. James St. Architect and builders, owners. Owners will receive tenders for foundation, brick work and other trades.

Candy and biscuit factory, cost $40,000, 245 Delorimier, for Aetna Biscuit Co., Ltd., 245 Delorimier ave. Architect, Jos. Sawyer, 407 Guy street. Require all kinds of candy and biscuitmaking machinery. Three storeys and basement, 57 x 100, cement foundation, reinforced concrete construction. Plans ready.

New Hamburg, Ont.

Office for Standard Reliance Mortgage Corporation, 84 King St. E., Toronto. Manager, W. S. Dinnick, c/o company. Plans under way.

Orillia, Ont.

Factory for C. N. W. Shoe Co., London, Ont. Town Clerk, C. E. Grant. Ratepayers will vote on July 21st, giving $25,000 and exemptions.

Ottawa, Ont.

Alterations to bank and office building, Metcalfe and Sparks streets, for Royal Bank of Canada, Sparks street. Have purchased buildings and will remodel.

Port Arthur, Ont.

Flour mill and elevator for Davidson & Smith, Hardisty street. Architects, Barnett & McQueen Co., Ltd., Fort William. Eight storeys. To have a capacity of 2,500 bbls. Plans ready.

Red Deer, Alta.

Hotel Alberta, cost $40,000, for Calgary Brewing Co., Calgary. Architects, Lang & Major, 231 8th ave. west, Calgary. Three storeys, 100 x 80, stone construction. Old buildings to be razed, new structure must be started so as to secure license for 1914.

St. Mary's, Ont.

Flour mill equipment for G. Carter & Son. Company contemplates installing additional equipment.

St. Catharines, Ont.

Rebuilding canning factory, Lake St., for Dominion Canning Co. Tenders received by architect, A. E. Nicholson, from August 1st until September 1st. 4 storeys, 50 x 150, reinforced concrete construction.

Toronto, Ont.

Addition to packing house, cost $25,000, Paton Rd., for Puddy Bros., 45 Paton Rd. Tenders received by architects, Chadwick & Beckett, 18 Toronto street. Four storeys.

Hotel and restaurant, 46 Richmond St., for J. J. O'Neill, 53 Wellesley street. Site purchased, 100 x 150. Buildings to be remodelled. Renewal of old St. Charles license applied for.

Addition to warehouse, cost $16,000, 74 Front St. E., for Bowes Co., Ltd., 74 Front E. Tenders called by architect, L. Foulds, 21 Leader Lane, about July 22nd. One storey addition, felt and gravel roofing, present building to be reinforced with steel.

Alterations to store and offices, cost $6,000, 780 Yonge street, for W. Tyrell, 95 King E. Tenders received by architect, R. A. Abraham, 23 Jordan street. Three storeys, 24 x 48, structural steel and brick construction, brick foundation.

Stores and apartments, Carlton & Church, for Robt. Davies, 244 Todmorden Rd. Architect, H. Simpson, 85 King E. Three storeys, 60 x 50, brick construction. Plans prepared.

Bank, Royce and Symington, for Bank of British North America. Architects, Mitchell & White, 55 Isabella street. Plans ready July 14th. Tenders received by architect. Two storeys, brick construction.

Winnipeg, Man.

Publishing plant, Transcona, for Transcona Times Co., Transcona. Architect, E. D. Tuttle, 701 McArthur Bldg. Plans prepared.

CONTRACTS AWARDED

Bracebridge, Ont.

Addition to tannery, cost $6,000, River Rd., for Beardmore & Co., 39 Front E., Toronto. Manager, P. A. Smith. Work done by day labor, under supervision of manager. One storey, 300 x 150, structural steel and hollow brick construction.

Calgary, Alta.

Stores and offices, cost $20,000, 8th ave. E., for E. H. Hume, Victoria, B.C. Builder, A. A. Ross, 201 David Block. 37 ft. 6 in. x 100 ft., cement foundation, brick construction.

Edmonton, Alta.

Store and apartments, cost $35,000, Fraser and Picard, for Jno. Hagmann, 789 Fraser ave. Architect and builder, T. C. Pennie, P. O. Box 431. General contractor, J. Warren, c/o owner. 3-storeys, 93 x 40.

Warehouse, cost $110,000, 3rd St. Architects and owners, Purcell & Kelly, 4th St. General contractors, Purcell & Foote, 4th street. Four storeys, 100 x 130.

Alterations to hotel, cost $25,000, Jasper W., for Robt. McDonald, Yale Hotel, Jasper ave. Architects, Magoon & MacDonald, Tegler Block. General contractors, Read, MacDonald & Brewster, Tegler Block. Three storeys, 100 x 50, brick and mill construction.

Store, cost $40,000, Namayo, for G. S. Armstrong, 433 Namayo ave. Architects, Magoon & MacDonald, Credit Foncier Bldg. General contractor, Cameron Anderson, 118 McCauley street. Five stys., brick construction.

Store and office, cost $15,000, Spruce, for E. S. McQuaid, Cariepy Block. Architect, P. Marvin, Jackson Block. General contractors, Bishop & Webster, 699 Namayo ave. Three storeys, 50 x 50 frame construction.

Fort William, Ont.

Elevator, cost $50,000, Island No. 2, for W. H. Dwyer, Ottawa and Fort William. Builder, D. A. Gordon, Luci Court, Fort William.

Hamilton, Ont.

Addition to factory, cost $5,000, Barton E., for Malcolm, Souter Furniture

Co., Barton E. Architects, Stewart & Witton, H. P. & L. Bldg. General contractors, Mitchell & Riddell, 91 Peter Street.

Foundry and Storage Warehouse, Clark street, for Otis-Fensom Elevator Co., Victoria ave., north. Architects, Stewart & Witton, H. P. & L. Bldg. Masonry, W. H. Cooper, 67 York St. Two storeys and basement, 200 x 45, 100 x 70.

Storage building, cost $30,000, for Canadian Colored Cotton Mills Ltd., 352 McNab St. N. Architect, Stewart McPhie, Bank of Hamilton Bldg. Masonry, Geo. E. Mills, 614 King E.

Montreal, Que.

Stables, stand, etc., cost $37,000, Dorval, for J. T. R. Laurendeau, 30 St. James St. Designer, Raouil Gariepy, 25 St. James street. General contractor, Damien Lalonde, cor. Colonial and Rachel streets. Frame construction.

Bank, cost $25,000, St. Catherine E. & Darling, for City & District Savings Bank, 176 St. James, Montreal. Architect, A. H. Lapierre, 51 Trust & Loan Bldgs. Masonry, Estate of M. Huberdeau, c/o Mr. Corbeil, cor. St. Catherine E. and Darling. Carpentry, P. Brouillet, 79½ St. Elizabeth. Roofing, heating, plumbing and electrical work, Roch Ouimet, 128 Bleury street. Painting, C. O'Brien, 25 Lorne ave. Plastering, F. Beaudoin & Fils, 536 Drolet. Marble, Robt. Reid, 125 St. Alexander. Three storeys, 25 x 50.

Offices, cost $10,000, St. Urbain, for James M. Aird, 165 St. Urbain. Architects, A. Gordon & Aird, 115 Stanley. Builder, J. W. Gordon, 2211 Clarke. Two storeys, 33 x 66, concrete foundation, reinforced concrete construction.

Store, cost $12,000, St. Catherine E., for Mrs. H. E. Vautelet, 69 Victoria ave. Architect, Chas. Bernier, 70 St. James. General contractor, Alf. Pion, 338 Marquette. Two storeys, 22 x 100, lime or sandstone and brick construction.

Moving picture theatre, cost $13,000 Monk Blvd., for A. Bourdeau and W. Pepin, 167 Hadley and 70 St. James, Ville Emard. General contractor, Renaud Legault, c/o owner. Private designer. 25 ft., 50 x 50, cement foundation, brick and concrete blocks construction.

Store, cost $18,000, Laurier, for A. Dalbec, 99 St. James. Architect, A. H. Lapierre, 30 St. James. Mason, A. Filion & Frere, 865 de St. Valier. Carpentry, Lamien Lalonde, cor. Rachel & Colonial. Three storeys and basement, 25 x 65, stone foundation, brick construction.

McAdam Jct., N.B.

Machine shop for Can. Pacific Ry. District Engineer, Geo. Wetmore, King St., St. John. General contractor, Henry Post, Woodstock, N.B. Bolts and rivets for steel work, Wm. Lewis & Son, Brittain street, St. John.

North Edmonton, Alta.

Addition to packing plant, cost $15,000, for The Swift Canadian Co. Architect and general contractor, J. McDermot, Winnipeg. Two storeys, 60 x 60.

Ottawa, Ont.

Office, warehouse, etc., cost $12,500, Frank, for J. T. Blythe, 394 Bank St. General contractors, masonry, carpentry, roofing and painting, Alexander & Campbell, 587 Lisgar. Plastering not let yet. Heating and plumbing, J. T. Blythe, 394 Bank street. Electrical work, Wm. R. McCallum & Co., 263 Laurier West. Solid brick construction.

Stores and offices, cost $150,000, Rideau, for Blackburn Bros., Creighton St. Architect, W. E. Noffke, Central Chambers, Queen street. Elevators, Otis-Fensom Co., Queen St. Masonry and electrical work done by day labor. Carpentry, Smith Bros., 310 Flora. Iron and and steel, Dominion Bridge Co., Sparks St. Copper, McFarlane & Douglas, 250 Slater. Painting, heating and plumbing not let yet. Plastering, Chas. Hunt.

Ottawa, Ont.

Stores, cost $15,000, Sparks St., for N. D. Porter, Bank St. General contractor, R. Holmes, 80 Arlington. General contractor is doing work by day labor.

Coal sheds and storage, cost $27,000 to $30,000, for J. G. Butterworth & Co., 86 Sparks street. Architect and general contractors, owners. Work being done by day labor, under supervision of Mr. Butterworth. Frame and brick constr.

Factory, cost $27,000, Nelson St., for Crown Lithographing Co. General contractors, A. Toms & Copeland, Arlington ave. Steel and iron, A. Marshall, 3 O'Connor St.

Port Arthur, Ont.

Flour mill and elevator, cost $358,000, for Davidson & Smith, Hardisty Street. Architect and general contractors, Barnett & McQueen Co., Ltd., Fort William. Eight storeys, reinforced concrete and brick construction, concrete dock to be built, machinery to be installed.

Garage, cost $20,000, for W. Foote, 234 Park street. General contractor George Otto, 206 Arthur St. Two storeys, brick construction.

Prince Rupert, B.C.

Hotel, cost $50,000, for Premier Hotel Co. Architect, J. N. Randall, Hutchinson Bldg. General contractor, C. L. Williams. Five storeys, 100 x 50, concrete and stone foundation, brick and reinforced concrete construction. Architect buys all material.

Regina, Sask.

Implement factory, cost $40,000, Rothwell Place, for Tenn Mfg. Co., Ltd., 210 Westmann Chambers. Architects, Storey & Van Egmond, Credit Foncier Bldg. General contractors, Smith Bros. & Wilson, Rose street. Two storeys, 113 x 80.

Departmental store, cost $500,000, Victoria ave., for C. W. Sherwood Co., Ltd. Architects, Brown & Vallance, Montreal, Que. Contractors, R. J. Lecky & Co., Ltd., Northern Crown Block Bldg. Four storeys and basement.

St. John, N.B. (West)

Grain elevator for Canadian Pacific Railway Company. General manager, F. R. Hodge, Montreal. General contractors, John S. Metcalf Co., Montreal, c/o J. K. Wyman, St. John West, N.B. Brick power house being roofed.

St. John, N.B. (Dock)

Repairs to warehouse, cost $5,000, for E. R. Owens, London Eng. c/o G. O. D. Otty, Richey Bldg., Princess St. General contractor, Ed. Bates, 73 Duke St.

Toronto, Ont.

Bank, Church and Wilton, for Sterling Bank of Canada. Architect, J. M. Lyle, 14 Leader Lane. Masonry, Smallwood Bros., 97 Clinton street. Carpetry, Jos. Dougherty, 106 Shuter St. Plastering and painting, F. G. Roberts, & Co., 106 Wells street. Heating and plumbing, J. R. Seager, 799 College St. Three storeys, 25 x 35, stone and brick construction.

Stores and offices, Yonge and Shuter, for Ryrie Bros., 134 Yonge St. Architects, Burke, Horwood & White, 28 Toronto street. Masonry, Elgie & Page, 18 Toronto street. Carpentry, J. C. Scott Lumber Co., River street. Steel, Toronto Structural Steel Co., Atlantic avenue. Roofing, A. Matthews, Ltd., 256 Adelaide W. Painting, Roberts & Co., 256 George street. Heating, plumbing and electrical work, Bennett & Wright, 72 Queen E. Stone carving, Watson & Cree, 836 Yonge street.

Theatre, cost $35,000, 502 Bloor West, for J. C. Brady, 413 Palmerston Blvd. Architect, J. A. MacKenzie, 203 Lumsden Bldg. Mason, H. N. Dancy & Son, 220 Howland ave. Carpentry, Jas. Sim, 372 Markham St. Plumbing, Mashinter & Co., 119 Simcoe street.

Victoria, B.C.

Addition to newspaper building, cost $20,000, for Victoria Daily Colonist. General contractors, Westholme Lumber Co., Government and Pandora. Four storeys, steel, frame and brick construction.

Winnipeg, Man.

Office building and restaurant, Smith St., for Olympia Cafe, 277 Portage ave. Architect, Jas. Chisholm, 310 Enderton Bldg. General contractors, Carter-Halls-Aldinger, 1010 Union Bank Bldg. Iron & steel, Minneapolis Steel & Macey Co., Minneapolis, Minn. Painting, general contractors. Cut stone, Winnipeg Stone Co. Steel casement, J. H. Ashdowne Co. Six storeys, 110 x 120, concrete foundation, structural steel and tile construction.

Residences

Calgary, Alta.

Residence, cost $6,000, Elbow Park, for Alberta Home Builders, 201 Grain Exchange. Two storeys, 29 x 33, frame, Plans ready.

Two residences, cost $5,000, Beaumont. Architects and owners, Topley Davidson & Co., 22nd St. E. Frame.

East London, Ont.

Twelve cottages, cost $20,000, for Argyle Land Co. (R. Metcalfe & Wood), 173 Dundas street. Architect, W. G. Murray, Dom. Savings Bldg., London. One storey, frame construction.

Edmonton, Alta.

Residence, cost $7,000, Syndicate. General contractor and owner, Vincent Barton. Architect, E. W. Morehouse. Two storeys, frame construction. Plans ready.

Fort William, Ont.

Residence, cost $5,000, Marks street, for R. Sproule. Tenders received by architects, Hood & Scott. 2½ storeys, 32 x 40, brick veneer construction.

Hamilton, Ont.

Residence, cost $10,000, Main St. E., for Walter Stewart, c/o architect. Tenders received by architects, Stewart & Witton, H. P. & L. Bldg. Two stys. and basement, 43 x 40, cement foundation, pressed brick construction.

Residence, cost $12,000, Wentworth, for Adam Inch. Mount Hamilton. Tenders received by architect, F. W. Warren, 808a Bank of Hamilton Bldg. Two storeys, basement and attic, 34 x 44, stone foundation, pressed brick construction.

London, Ont.
Alterations to bachelor apartments, for Argyle Land Co. (R. Metcalfe & Wood), 173 Dundas street. Architect, W. G. Murray, Dominion Savings Bldg. Plans ready.

Ottawa, Ont.
Residence, cost $7,000, Wendover, for Sam S. Lucy, 1147 Bank street. Brick construction, stone foundation. Plans being prepared.

Residence, cost $5,000, Concord street, for C. Nelson, 111 Lees ave. Brick construction, stone foundation. Plans in progress.

Medicine Hat, Alta.
Residence, cost $5,500, for I. Inwood, Manager Quebec Bank. Lots 7-8, Block 4, Herald Sub. Architect, M. N. Purdy. Two storeys, 35 x 83, steel lath and cement construction.

Montreal, Que.
Apartment house, cost $30,000, Cote St. Luke, for J. P. Stephen, Star and Nosworthy, 814 New Birks Bldg. Plans being changed and tenders to be called again.

Residence, cost $17,500, Outremont (St. Catherine Rd.), for T. Viau, 481 St. Denis St. Architect, A. H. Lapierre, 30 St. James street. Two storeys, 42 x 44, stone foundation, stone and brick construction. Plans prepared.

Residence, cost $15,000, Outremont, for E. Ducharme, 714 Ontario, Maisonneuve. Architect, J. A. Ouellette, 250 Amherst. Three storeys, 30 x 80, stone foundation, stone trim and brick construction. Plans ready.

Residence, cost $10,000, for Alex. Mackay, St. Martin and Dorchester streets. Architect and builder, owner. Owner open to receive tenders for plastering. 2½ storeys and basement, 23 x 60, brick construction.

Notre Dame des Victoires, Que.
Residence, cost $24,000, for Parish of N. D. Des Victoires. Architects, Viau & Venne, 76 St. Gabriel, Montreal. General contractor, masonry, carpentry, iron and steel, J. B. Legare, 1235 Delorimier, Montreal. General contractor calling tenders for roofing, painting and electrical work. Heating and plumbing, Mr. Otis, Parish of Notre Dame des Victoires.

Regina, Sask.
Apartment block, cost $60,000, Victoria ave. and Argyle St., for David D. Bennett, 2108 Albert St. Architect, S. G. Tripp, Suite 5, Princess Theatre, Scarth St. Three storeys and basement, fireproof, reinforced concrete, stucco finish over brick, 24 suites. Tenders received by architect.

South Calgary, Alta.
Residence, cost $5,000. Architect and owner, H. B. McDonald, 707a First St. E. 22 x 33, frame. Plans prepared.

St. Catharines, Ont.
Residence, cost $5,000, Bellevue ave., for G. L. Sherk, Midland St. Architect, Joseph Daw, 165 St. Paul St. Tenders received by owner until July 31st. Two storeys, 40 x 26, frame construction.

St. John, N.B.
Apartment house, Bermain and Princess. Interested, Hon. Wm. P. Pugsley, Pugsley Bldg. Architect and builder, J. J. Laferme, c/o Hon. Wm. P. Pugsley, Pugsley Bldg. Eight storeys, fifty suites, cement foundation, concrete, stone structural steel and brick construction. Plans ready.

Toronto, Ont.
Alterations to residence, cost $5,000, Deer Park Cres., for A. J. Jackson, 6 Deer Park Cres. Architect, F. H. Herbert, 45 Adelaide E. Work will probably be done by day labor. 2½ storeys, brick construction.

One pair residences, cost $7,000, for Mr. Miller, 123 Bay street. Tenders received by architect, A. J. Rattray, 123 Bay street. Two storeys, 26 x 48, brick construction and foundation.

Residence, cost $5,000, Wells Hill ave., for J. W. Redfern, 63 Kendall. Architects, Craig & Madill, 304 Manning Chambers. Two storeys, 24 x 36, brick construction and foundation.

Residence, 3 Oriole Rd., Parkway, for P. W. Ellis, et al, Wellington E. Architects, Curry & Spalding, 105 Bond St., will call for tenders about July 22nd. Three storeys, steel and brick construction, stone foundation.

Three attached residences, cost $8,000, Crawford St., for Algate & Peacock, 1026 Queen St. W. Owners now open for tenders. 2½ storeys, brick construction and foundation.

Victoria, B.C.
Four residences, for Prov. Govt., Dept. of Public Works. Minister, Hon. Thos. Taylor. Government engineer, J. E. Griffith. Tenders received by Minister until noon July 28th, for the erection and completion of the following residences at the Mental Hospital, Essondale, B.C.; Residence for Head Gardener, Engineer, Bursar, Assistant Medical Superintendent. Plans, specifications, etc., at offices of J. Mahoney, Govt. Agent, Vancouver, S. A. Fletcher, Govt. Agent, New Westminster, and at Dept. of Public Works, Victoria.

Westmount, Que.
Residence, cost $32,000, Mt. Crescent Heights. Architect, R. E. Bostrom, New McGill Bldg. Three storeys and basement, 30 x 65, cement foundation, solid brick construction. Tenders called by architect about July 25th.

Winnipeg, Man.
Apartment block, cost $15,000, Maryland, for J. F. Parker, 194 Young street. Architect, E. W. Crayston, Ross avenue. Three storeys and basement, 30 x 90, pressed and common brick construction.

CONTRACTS AWARDED

Calgary, Alta.
Residence, cost $5,000, Houndsfield Heights for F. McNally, c/o builder, C. A. Maus, 1316 15th St. N.W. Two stys., 28 x 30 ft. 6 in., frame construction.

Residence, cost $8,000, Elbaya, for E. F. Adams, 501 18th ave. west. Builder, H. Templeton, 2314 4th street west. 2-storeys, 36 x 35, frame construction.

Edmonton, Alta.
Residence, cost $15,000, Athabasca. General contractor and owner, T. W. McKerman, Royal George Hotel. Architect, Jas. Henderson. 2½ storeys, 34 x 34, brick veneer construction.

Six residences, cost $15,000, Wilton. General contractor and owner, W. E. Ostrander, 603 Tegler Block. One sty., 24 x 34, frame construction.

Residence, cost $7,000, Syndicate. General contractor and owner, Vincent Barton. Architect, E. W. Morehouse. Two storeys, frame construction.

Residence, cost $5,000, 25th street. General contractor and owner, A. H. Monesly, 10 Alberta Loan Block. 2 storeys, 30 x 30, frame construction.

Hamilton, Ont.
Twelve residences, cost $24,000, Cumberland ave., for Hamilton Dwellings Ltd., c/o General contractor, R. G. Wilson, Rutherford ave. Concrete foundation, brick construction.

Five residences, cost $7,500, Morris ave. General contractors and owners, Wooley & Farewell, King St. E. Frame construction.

Four residences, cost $8,000, Sherman ave. General contractors and owners, McKay Bros. Brick construction.

Lake Mantou, Que.
Summer bungalow, cost $6,500, for S. B. Townshend, 18 St. Sacrament, Montreal. Builder, R. Ryan, rear 697 Atwater ave., Montreal. Two storeys, frame construction.

Medicine Hat, Alta.
Residence, cost $8,000, Lockwood St., for R. A. Sewell, c/o Perry, Sewell & Perry, Toronto St. Architect, W. T. Williams, Porter Block. General contractors, Worthy & Fulton. 2½ storeys, 30 x 40.

Montreal, Que.
Six flats, cost $8,000, for W. Dalphy, 121 Addington. Builder and architect, owner. Masonry, carpentry, roofing, painting, interior fittings, builder. Heating and plumbing, E. & H. Madore, 2550 Notre Dame W. Electrical work, Valee & Hamlin, 1867 St. James St. Owner contemplates more flats as soon as these are finished.

Residence, cost $25,000, Westmount (Aberdeen ave.), for R. C. Patton, Quebec Bank Bldg., or 421 Mackay. Architects, Cox & Amos, 6 E. T. Bank, St. Catherine St. W. General contractor and carpenter, D. M. Long, 39 Windsor. Tenders called by general contractor for masonry, roofing, painting, heating, plumbing, electrical work, interior fittings, plastering. 2½ storeys and basement, 33 x 64, stone foundation, Indiana cut stone and pressed brick construction.

Three flats, cost $9,000, Addington, for Cheri Gagne, 325 Old Orchard. Architect and builder, owner, Two storeys and basement, 23 x 50, cement foundation, stone trimmings, brick construction.

Two flats, cost $11,000, Grey ave. Builder and owner, John H. Hand, 609 Belmont ave. Architects, Wright & Son, St. James St., Two storeys, 50 x 50.

Twelve flats, cost $15,000, Christopher Columbus, Builder and owner, F. Frank, 619 De Flemimont. Three storeys, 75 x 65, concrete foundation, brick construction.

Parsonage, cost $10,000, Sherbrooke and Cartier, for Congregation L'Eglise du Redempteur, c/o Rev. H. E. Benoit, 1105 Sherbrooke E. Architects and builders, members of congregation. Three stys., 25 x 65, cement foundation, stone and brick construction.

Three flats, cost $4,500, Chabot. Build-

(Continued on page 78)

Tenders and For Sale Department

Brantford Hydro-Electric System

Tenders Wanted

Sealed tenders, addressed to the Brantford Hydro-Electric System, 8 Commercial Chambers, Brantford, Ont., and endorsed "Tender for Substation Building," will be received until 12 o'clock noon on **Wednesday, the 30th day of July, 1913**, for the construction of a concrete and brick sub-station building.

Drawings, specifications and form of tender may be obtained on application to the above address.

The lowest or any tender will not necessarily be accepted.

Brantford Hydro-Electric System.
Brantford, Ont., July 16, 1913. 30

Tenders for Dredging

Sealed tenders will be received at the Clerk's office, Chatham, Ont. (where plans and specifications can be seen) up to 12 o'clock noon, on Thursday, July 31st, 1913, for dredging about 9 miles of drainage work in the Township of Dover, County of Kent. The work to be let subject to the final passing of the By-law.

The lowest or any tender not necessarily accepted. Tenders must be marked "Tenders for Dredging," and each accompanied with a marked guarantee cheque for $2,000.

Dated, June 17th, 1913.

H. M. BEEHARD, Reeve.
JOHN WELSH, Clerk,
26-30 Chatham P. O.

Sealed tenders addressed to the undersigned and endorsed "Tender for Toronto Harbour Works," will be received at this office until 4 p.m. on **Monday, August 25, 1913**, for the construction of a Sea Wall, Breakwater, Ship Channel and Retaining Walls at the City of Toronto, in the County of York, Province of Ontario.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department and at the offices of J. G. Sing, Dist. Engineer, Confederation Life Bldg., Toronto, Ont.; Harbour Commissioner's Office, 76 Adelaide St. West, Toronto; H. J. Lamb, Esq., District Engineer, Windsor, Ont., and J. L. Michaud, Esq., District Engineer, Post Office, Montreal, Que.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to five per cent. (5 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, July 12, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—44297. 29-30

Tenders for Debentures

Municipality of McIrvine

Sealed tenders addressed to the undersigned will be received for the sale of thirteen $1,000 twenty-year Sinking Fund School Debentures bearing interest at 6 per cent.

FRANK J. STRAIN, Clerk.
29-30 Fort Frances, Ont.

Notice to Contractors

Sealed proposals will be received at the offices of the Water Commissioner, City Hall, until 12 noon, **July 31st, 1913**, for the fabrication and laying of about 10¼ miles of 36-in. rivetted steel pipe and appurtenances on the line of the Sooke Water Supply pressure conduit, and in accordance with the requirements of the general specifications prepared by Wynn Meredith, Consulting Engineer for such construction, pursuant to the provisions of By-law No. 814.

Plans and specifications can be seen, and forms of tender obtained at the Sooke Water Supply Office, 1414 Douglas Street, Victoria, B.C.

The lowest or any tender not necessarily accepted.

C. H. RUST,
Water Commissioner.
Victoria, B.C.,
June 27th, 1913. 28-29-30

Sealed tenders, addressed to the undersigned, and endorsed "Tender for Wharf at Vancouver, B.C.," will be received at this office until 4 p.m., **on Thursday, August 21, 1913**, for the construction of a Wharf at Vancouver, B.C.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department and at the offices of C. C. Worsfold, Esq., District Engineer, New Westminster, B.C.; J. S. MacLachlan, Esq., District Engineer, Victoria, B.C., The District Engineer's Office, Confederation Life Building, Toronto, Ont.; J. L. Michaud, Esq., District Engineer, Post Office Building, Montreal, Que., and on application to the Postmaster at Vancouver, B.C.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and places of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to five per cent. (5 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, July 8, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—44661.
29-30

TENDERS

Will be received by the undersigned up to **Friday, August 15th, 1913**, for the erection of a three storey concrete and brick Municipal building for the Town of Cobalt, approximately 43 ft. x 100 ft., according to plans and specifications prepared by Messrs. Angus & Angus, Architects, North Bay.

Contractors are required to enclose a marked cheque along with each tender for five per cent. of the amount of same, the lowest or any tender not being necessarily accepted.

Work to commence immediately on award of contract.

Plans and specifications may be seen at the office of the architect or at the office of the undersigned.

R. L. O'GORMAN,
Town Clerk,
30-31 Cobalt, Ont.

PRICEVILLE, ONT.

Tenders for Steel Bridge and Abutments

Sealed tenders marked "Tender," addressed to the Reeve, Township of Glenelg, Priceville, will be received up to **August 1st** for the construction of a bridge at Traverston, near Markdale.

Tenders will be received as follows:—

1. Two concrete abutments.
2. Reinforced concrete floor, 110 x 14 ft.
3. Steel bridge, 110 ft. span, 14 ft. wide.

An accepted bank cheque for 5 per cent. of contract, payable to the Treasurer of Twp. of Glenelg, shall accompany each tender and will be returned on non-acceptance.

Plans and specifications may be seen at the offices of the Reeve or Engineer.

The lowest or any tender not necessarily accepted.

THOS. NICHOL, Reeve.
Priceville, P.O.
R. McDOWELL, Engineer,
29-30 Owen Sound, Ont.
Priceville, July 14, 1913.

TOWN OF BASSANO, ALBERTA

Sewage Disposal Works

Sealed tenders, addressed to the undersigned, will be received up till 18 o'clock on **Friday, 15th August, 1913**, for all labor and materials (except filter distributors) necessary for the construction of sewage disposal works, consisting of tank and filter and relative works near the Town of Bassano.

Tenders must be accompanied by an accepted cheque for five per cent. of the amount of the **tender, or alternatively by the bond of an approved** guarantee company.

Plans and specifications and other information may be obtained at the offices of the Consulting Engineers at Winnipeg and Calgary, on deposit of **$25**, which will be returned to bona fide tenderers on return of the plans.

The Corporation do not bind themselves to accept the lowest or any tender.

GEO. B. R. BOND, Sec.-Treasurer,
July, 1913. Bassano, Alta.

The John Galt Engineering Co., Ltd.,
Consulting Engineers. 29-30

Tenders For Bridge Construction

Sealed tenders plainly marked as to contents, will be received by the undersigned up to noon of **Wednesday, August 6th, 1913**, for the construction of a reinforced concrete beam bridge on Yonge Street, just north of Aurora, in the County of York.

Plans and specifications and all necessary information may be seen at the office of the undersigned, 57 Adelaide Street East, Toronto. The lowest or any tender not necessarily accepted.

FRANK BARBER, County Engineer.
Toronto, July 22, 1913. 30

Tenders for Bridge

Tenders will be received up to noon, **August 11th, 1913**, at Lamlash, for the erection of a steel bridge, 90 ft. c. to c., on Lat. 20 x 21 in Con. 3 S. D. R. Bentinck. Also for two abutments for the same. Plans and specifications may be seen with Henry Metcalf, Hanover, or James Warren, Engineer, Walkerton. A certified cheque for $200 to accompany each tender, payable to the Treasurer of the Township of Bentinck.

(Signed) ALEX. WILSON,
Emwood, Ont.
Bentinck, July 7, 1913. 30

PETROLIA, ONT.

Tenders for Concrete Trunk Sewer

Tenders will be received by the undersigned up to 5 p.m. on **Monday, the 28th day of July, 1913**, for the re-construction with cement concrete work of about 1,000 lineal feet of outlet to Trunk Sewer in the Town of Petrolia.

Plans and specifications may be seen at the Town Clerk's office.

The lowest or any tender not necessarily accepted.

29-30 J. McHATTIE, Town Clerk.

Tenders for Painting

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, Canada, up to noon on Tuesday, August 5th, 1913, for painting North Glen Road Bridge over Rosedale Ravine, St. Clair avenue (Moore Park), over Vale of Avoca, and Wallace Avenue Bridge—foot bridge over C. P. R. and G. T. R. tracks.

Specifications and tender form may be obtained upon application at the office of the Railway & Bridge Section, Department of Works, City Hall, Toronto.

Envelopes containing tenders must be plainly marked on the outside as to contents.

The usual conditions relative to tendering as prescribed by City By-law must be strictly complied with or the tenders may be declared informal.

Tenderers shall submit with their tenders the names of two personal sureties approved by the City Treasurer or in lieu thereof, the bond of a guarantee company approved as aforesaid.

The lowest or any tender not necessarily accepted.

H. C. HOCKEN, Mayor,
Chairman, Board of Control.
City Hall, Toronto,
July 15th, 1913. 30

DERRICKS FOR SALE

One 25-ton Terry & Tench travelling stiff leg derrick.

One 20-ton stiff leg derrick.

One 15-ton stiff leg derrick.

No reasonable offer refused.

National Sand & Material Company, Ltd.
30-31-32 Welland, Ont.

Tenders Wanted

Sealed tenders will be received by the undersigned until **Wednesday, July 30th**, for the construction of the following works for the Counties of Halton and Wellington, or tenders may be handed in at the Court House, Guelph, up till 3 p.m., Thursday, July 31st.

A. 51 ft by 18 ft. Steel Highway Bridge at Eden Mills between the townships of Eramosa and Nassagaweya.

B. Concrete abutments for same.

C. Alternative design for concrete arch with suspended floor.

D. Retaining walls at Rockwood 145 ft. long.

For plans, specifications and other information apply to

JOHN S. FORD, Esq., Milton, Ont.
D. ANDERSON, Fergus, Ont.
BOWMAN & CONNOR, Engineers,
30 Toronto, Ont.

TENDERS
FOR
Equipment of Municipal Abattoir and Rendering Building now being erected at the foot of Tecumseh Street, Toronto

Separate tenders for the several trades mentioned below in connection with the above buildings will be received by registered post only addressed to the undersigned up till noon on **Tuesday, August 5th, 1913.**

1. Machinery for Killing Departments, Pens, Iron Fencing, etc. Tanks, and Rendering Machinery.
2. Ice Machine and Motor, with all Piping, Condenser, and Foundations.
3. Insulation of Chill Room—floors and walls.
4. Electric Wiring, Fixtures, etc.
5. Steam Heating for Offices and Men's Rooms.
6. Cattle Chute, Connecting Bridge, Conduct Catch Basin, Chimney, Elevators, Chill Room, Drip Pans.
7. Boiler Room Equipment, including Boilers, Heater, all Piping, Fittings, and Pumps.
8. General Painting of Buildings, Iron Work, Machinery, Pens, Fences, etc.

Plans and specifications may be seen and forms of tender and all information obtained at the office of Messrs. William R. Perrin & Co., 530 King street east, Toronto, and No. 200 Old Colony Building, corner Dearborn and Van Buren Streets, Chicago, Ill.

Envelopes containing tenders must be plainly marked on the outside as to contents.

The usual conditions relating to tendering as prescribed by City By-law must be strictly complied with or tenders will not be entertained, and all tenders are to be subject to the condition that the work will be finished by April 1st, 1914.

Parties tendering shall submit with their tender the names of two personal sureties or the bond of a guarantee company.

The lowest or any tender not necessarily accepted.

H. C. HOCKEN, Mayor,
Chairman Board of Control.
30

Tenders for Bridge Covering

Tenders will be received up to **6 o'clock P.M. August 4th, 1913**, for the recovering of the East End bridge, Walkerton. Tenders may be for the whole or separately for the steel and cedar flooring. Specifications may be seen with the undersigned.

A. E. McNAB,
Walkerton, Ont.
Chairman of Committee.
Walkerton July 21st, 1913. 30

Tenders for Bridge Construction

Sealed tenders, plainly marked as to contents, will be received by the undersigned up to noon of **Wednesday, August 6th, 1913**, for the construction of a reinforced concrete culvert on Yonge street at Langstaff opposite Lot 36, Markham, in the County of York.

Plans and specifications and all necessary information may be seen at the office of the undersigned, 57 Adelaide Street East, Toronto. The lowest or any tender not necessarily accepted.

FRANK BARBER, County Engineer.
Toronto, July 22, 1913. 30

BRIGHTON, ONTARIO

NOTICE

Whole or separate tenders will be received up to noon of **Monday, July 28th**, for the erection of a factory building. Plans and specifications for which may be seen at the office of the architect, W. A. Mahoney, O. A. A., Guelph, or at the office of Geo. Drewery, B.A., Barrister.

Lowest or any tender not necessarily accepted.

(Signed) GEO. DREWERY, B.A.,
Barrister,
30-31 Brighton, Ontario.

For Sale

FOR SALE.—Three Second-Hand Contractor's Dinky Vulcan Locomotives in first-rate condition. One 9-in. x 14-in. and two 10-in. x 16-in. Also a 50-ton Steam Shovel, and some contractors' Dump Cars. Apply to The Canadian Fairbanks-Morse Co., Ltd., 444 St. James Street, Montreal. 30-31

Special Notice

Every man who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works are advertised.

Send along your plans when asking for tenders put a line in your advertisement to that effect.

No extra charge is made for filing plans at one or all four offices.

Contract Record and Engineering Review

Montreal—119 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—429 Pender Street.

BARGAINS!

1 Thew Steam Shovel, used less than 90 days, shop number 690; like new	$3,300
30 1½-yd. dump cars, 36-in. gauge; practically new. Each	30
1 American Well Air Compressor, 12 x 12 x 14, 340 ft. capacity, new	440
1 Rand Belted Air Compressor, 10 x 14; A.1.	240
1 Buckeye Trenching Machine, steam driven; cuts trench 27-in .wide to 8 ft. deep. Overhauled and A.1.	2,500
2 American, 6¼ x 10, D.C., D.D. Hoisting Engines with boilers and boom swingers, A.1. Each	725
1 Three-drum Stronsburg 7 x 10 Hoisting Engine with boiler; practically new.	725
1 Gates No. 5 Crusher, 2 arm Spider, rear drive (Rebuilt B.) Exceptionally low price.	

For anything else second hand, write

WILLIS SHAW MACHINERY CO.

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For Sale

One Koehring Concrete Paving Mixer, capacity 14 cu. ft.

One Austin Cube Concrete Paving Mixer, capacity 9 cu. ft.

One 20 h.p. Case Traction Engine.

All of above used only a few months and in perfect condition.

Apply Box 831, Contract Record, Toronto, Ont.
29-t.f.

Residences

(Continued from page 75)

er and owner, A. Robert, 1432 Chabot. Three storeys, 27 x 58, cement foundation, brick construction.

Flats, cost $5,000, Maisonneuve (Bennett), for E. Bisson, 106 Bennett. Builder and general contractor, owner. Three storeys, 25 x 42, brick construction.

Four flats, cost $7,000, Addington, for Jos. St. Andre, 17 Strathmore. Architect and builder, owner. Two storeys, 50 x 40, stone foundation.

Residence, cost $12,000, Roslyn ave., for Geo. Rabinovitch, Room 35, 30 St. James street. Architects, Saxe & Archibald, 59 Beaver Hall Hill. Mason, J. H. Hutchison, 64 St. Ambroise. Other contracts not yet awarded. 2½ storeys, 23 x 55, stone foundation, stone trimmings, brick construction.

Ottawa, Ont.

Residence, cost $7,000, Echo Drive, for Miss M. Munsie, 43 Aylmer ave. General contractor, J. R. Howe, 324 Mutchmore. Heating and plumbing, J. P. Band, 344 Bank. All other contracts are being done by general contractor.

Addition to apartments, cost $7,000, Besserer, for Mrs. H. Lyons, 316 Besserer street. Architect, W. E. Noffke, Central Chambers, Queen street. General contractor and carpenter, F. F. Slack, 95 Flora street. Mason, Mr. Bouchea, Clarence street. Painting not let yet. Heating and plumbing, Holloway & Son, 373 Somerset. Electrical, P. S. Ackroyd, 184 Bank street.

Toronto, Ont.

Detached residence, cost $10,000, Rosedale Rd., for Jno. Clouson, c/o architect, J. M. Lyle, 14 Leader Lane. Cut stone, Oakley & Son, 278 Booth ave. Masonry, Wm. Hughes, 216 Simcoe St. Carpentry, Weller & Co., 54 Tecumseth street. Roofing, Duthie & Son, 30 Widmer street. Plastering, W. J. Hynes, 718 Dupont street. Painting, J. R. Robinson, 425 Sumach street. Plumbing, R. C. Mansell, 85 Quebec ave. Electrical, H. Alexander, Bank of Toronto, King and Bay streets.

Residence, cost $13,000, St. Clair and Spadina Road, for L. J. Applegath, 155 Yonge street. Architect, C. J. Gibson, Janes Bldg. Carpenter, P. J. Corcoran, 306 St. Clarens ave. Plastering, Hanna & Nelson, 273 Rusholme Road. Plumbing and heating, F. Armstrong, Queen St. W. 2½ storeys.

Nine pair and one detached residences, cost $50,000, Boom ave. Builder and owner, J. W. & J. S. Rankin, 243 St. Clarens ave. Owners employ regular staff for all trades. 2½ storeys, 42 x 44, pair, brick construction and foundation.

Residence, cost $18,000, Walmer and Davenport, for E. J. Lennox, 164 Bay street. architect and general contractor, owner. Masonry and stone, Page & Co., Queen's Park. 2½ storeys, 60 x 100, stone, structural steel and brick construction.

Winnipeg, Man.

Two residences, cost $11,000 each, Wellington Cres. Architect, Frank Peters, Phoenix Bldg. General contractors, Simmons Bros., 1200 Garfield ave. 2½ storeys and basement, 32 x 47, pressed brick construction.

Power Plants, Electricity and Telephones

Aurora, Ont.

Electrical appliances, cost $21,000, for Town Council. Clerk, S. H. Lundy. Bylaw will be voted on August 4th. $16,000 for electrical equipment for light and power. $5,000 for electrical pumps for waterworks.

Brantford, Ont.

Elec. substation for Brantford Hydro-electric System. Tenders called until 12 o'clock noon, July 30th. Specifications, etc., at 8 Commercial Chambers, Brantford.

Medicine Hat, Alta.

Telephone exchange building, cost $85,000, for Provincial Govt., Dept. of Railways and Telephones. Deputy Minister, W. J. Harmer, Edmonton. Three stys., stone and brick construction. Automatic telephone system to be installed. Plans prepared.

New Toronto, Ont.

Electric plant for Village Council. Bylaw carried for $7,000, cost of erecting poles and extensions from sub-station. Contract will be made with Ontario Hydro-electric Commission for supply of power.

Sault Ste. Marie, Ont.

Electric elevator for Dominion Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa, Ont. General contractors, D. Jamieson & Son. Electric passenger elevator for public bldg.

Toronto, Ont.

Lightning arresters, cost $7,000, Davenport, for Toronto Power Co., Davenport Rd. Architect, H. G. Salisbury, 12 Adelaide E. One storey, 24 x 48, structural steel and brick construction.

Victoria, B.C.

Steel conduit for City Council. Tenders received by Water Commissioner C. H. Rust until July 31st, for the fabrication and laying of about 10½ miles of 16-in. rivetted steel pipe, etc. Plans, etc., at Sooke Water Supply Office, 1414 Douglas street.

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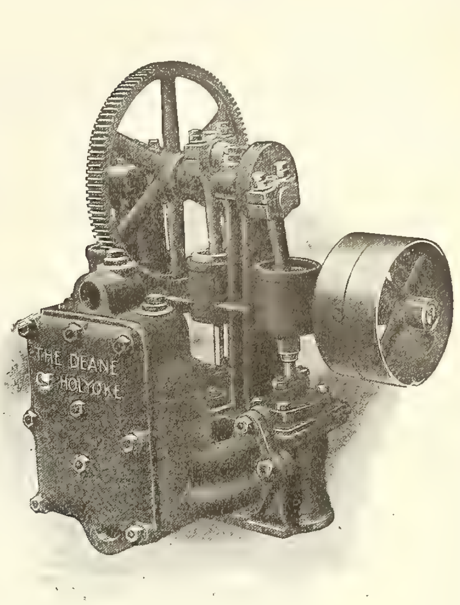
Tenders

A few dollars spent in advertising your proposals in the

Contract Record
and Engineering Review

would result in additional competition, which might save your city or town or your client many hundreds of dollars.

DEANE POWER PUMPS



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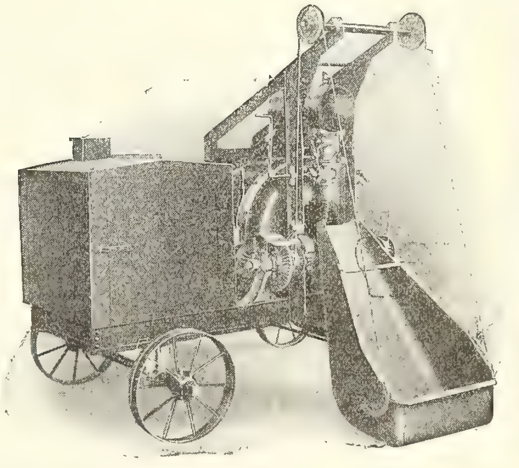
Manufacturers of Boilers, Castings, Condensers, Elevators, Engines, Filters, Forgings, Hydraulic Machinery, Pumps, centrifugal and reciprocating, Steam Turbines, Tanks, Water Wheels, Water Works Plants.

On All Classes of Work KOEHRING MIXERS are mixing their way to popularity because of the Dollar Saving Qualities

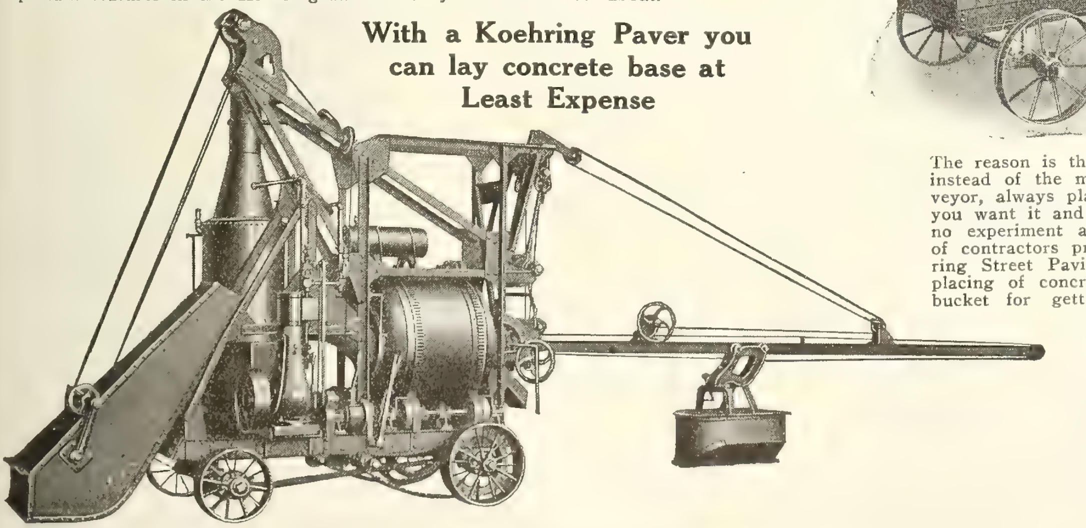
The Koehring 3 in 1 principle of mixing means three times as much mixing or an equal amount of mixing in one-third of the time. There are three independent and opposed mixing actions in the Koehring drum producing thoroughness of mixing and rapidity of mixing and a uniformity of mixing, no other Mixer equals. There are also equally important advantages in the mechanical construction of the Koehring Mixer.

The heavy cast special metal Koehring drum will outlast the drum of any other Mixer. The railroad truck bearing truss and the rollers being keyed on to the axle, makes "wabbly" drums impossible.

The charging bucket raises to a nearly vertical position so that all the material will pass into the drum without pounding the bucket. There are numerous other important features in the Koehring Mixer that you should know about.



With a Koehring Paver you can lay concrete base at Least Expense



The reason is the machine conveys the concrete instead of the men, and it's a dependable conveyor, always places the concrete exactly where you want it and always dumps clean. There is no experiment about it, the records of dozens of contractors prove the economy of the Koehring Street Paving Mixer and it combines this placing of concrete with a simple charging bucket for getting material into the drum in shortest possible time and least number of men, also, it has traction drive for moving the machine along the line of work and keeping close to the material pile. This builds contractors' reputations and pays handsome profits. Aren't you interested in this reputation and profit making?

KOEHRING MACHINE CO., Milwaukee, Wis. Exclusive Sales Agent for Canada: **Canada Foundry Co., Limited**

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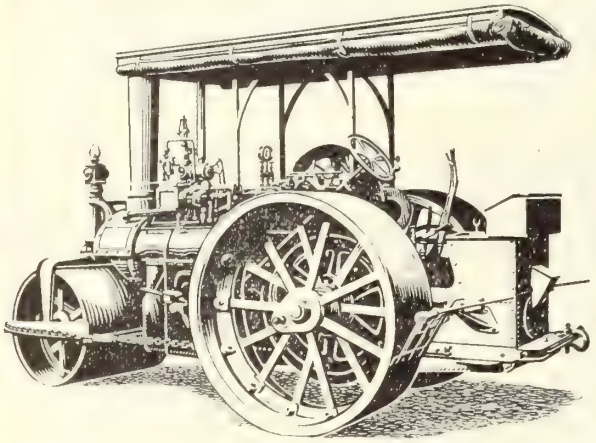
"165 Waterous Rollers sold in Canada? They MUST Do All You Claim for Them."

"That's exactly it. If the Waterous Steam Roller did not do all we claim for it—even more—we would have few repeat orders on our books. Cities like Vancouver, Toronto, Hamilton, and Ottawa would not be using from four to seven Waterous Rollers each to build their roads for them."



The Waterous Steam Roller

can be used in every operation in road making, on every kind of road work, and is constructed to be ready for use every working day in the year. We have records of machines which have been in operation over nineteen years and that are still doing first-class work.

Waterous Steam Rollers are used by the largest municipalities and leading road building contractors in Canada to-day to cut their costs 20%. The Waterous Roller can do as much for you.

The Waterous Roller Book is small, short and interesting and covers the points you want to know about. Our list of Canadian users accompanies it. Write

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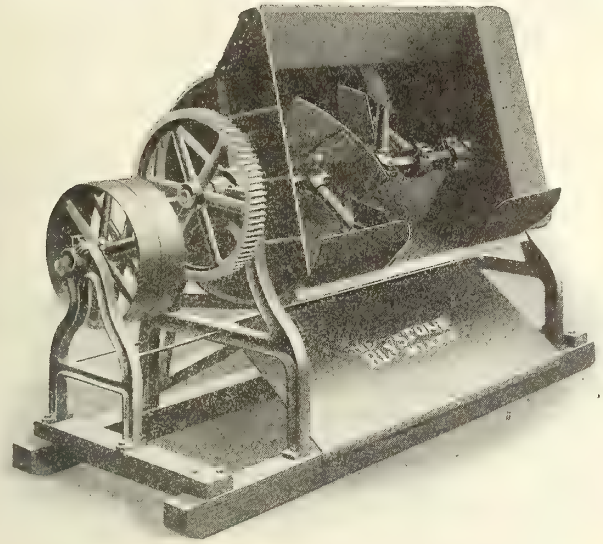

The Blystone Skid Mixer

The perfect design and construction of this mixer reduces the working cost to a minimum and effects the greatest ease in operation. All working parts are strongly made and will not get out of order.

Easy to work—Easy to Clean High efficiency—Low cost

SEND FOR PARTICULARS

The Blystone Machinery Company
61 Railroad St., CAMBRIDGE SPRINGS, Pa., U.S.A.
Full line of Blystone Mixers carried in stock by
The A. R. WILLIAMS MACHINERY COMPANY, Limited
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"Eastlake"

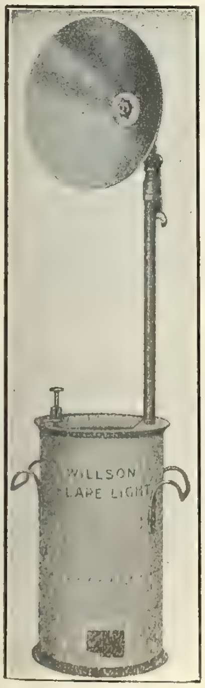
Steel Shingles

There is a great and growing demand for "Eastlake" Steel Shingles, because they make fire-proof, lightning-proof and weather-proof roofs that are very low in cost and will give longer service than any other roof yet produced.

These shingles have many strong points found in no others. Why not write to us for catalog R 2 and prices? It will pay you.

THE METALLIC ROOFING CO.
OF CANADA LIMITED.
TORONTO AND WINNIPEG

Contractors' Acetylene Flare Lights



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SIZE NO 1—

8,000 Candle Power, operates 12 Hours on 18 lbs. Carbide.

Price F.O.B. Ottawa $95.00.

SIZE NO. 2—

1,000 Candle Power, operates 12 Hours on 8 lbs. Carbide.

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Manufactured by

International Marine Signal Co. Limited
Ottawa, Canada

FOR SALE

1—D.D. Electric Hoist.
1—No. 5 Pulsometer Pump.
5—Rock Drills.
Irons for two travelling 10 ton Derricks.
40—36 Gauge 4 Yard Dump Cars.
1—6x9 Sand Pump, Steam Connected.
1—50 H.P. Tubular Boiler.
1—35 H.P. Fire Box Boiler.
2—6x3 3/4x6 Duplex Pumps.
2—5 1/4x4 3/4x5 Duplex Pumps.
1—No. 5 Rumsey Hydraulic Ram.
1—No. 2 Milwaukee Concrete Mixer, (New.)
1—Set Irons and Buckets for No. 5 Austin Stone Elevator.
1—No. 4 Champion Stone Crusher.
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The above machines are but slightly used and are in good working order.

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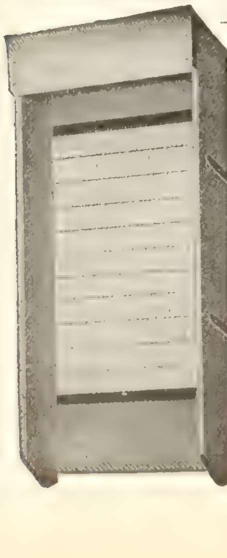

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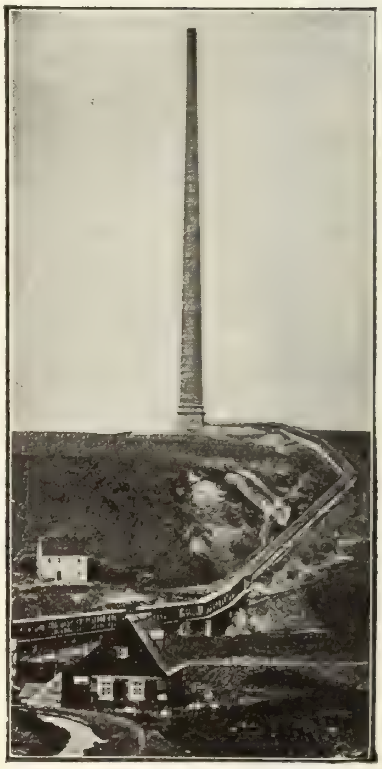

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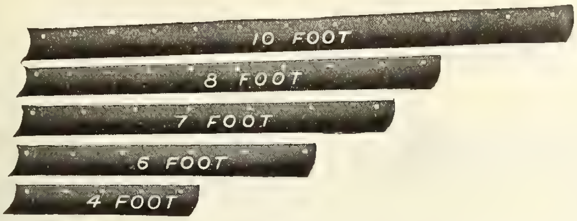

We manufacture and carry in stock road plows, scraper blades and moldboards ½ inch thick and lighter, of the very highest quality of steel and workmanship, for all makes of road scrapers. Blades guaranteed to be of the very best quality. Write for prices, discounts and list No. 20.

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New Code Rubber Covered Wires AND Cables

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80,000 sq. ft. Barrett Specification Roofing on this building.

This building is but one of the many large contracts executed by us.
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Popular, because its deep uniform red shade is always the same and never fades.

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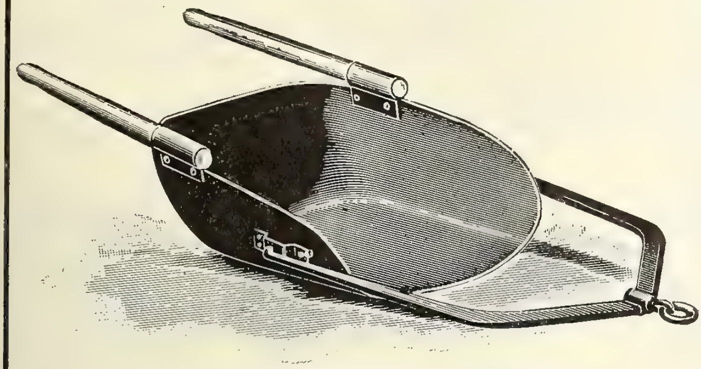

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IRON AGE

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Catalogue will be sent free on request.

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Here's the latest addition to the WONDER line of Concrete Mixers. This Side Loader practically doubles the capacity of the LITTLE WONDER "FIVE" and the WONDER "TEN." The neck of the bucket is wide. Materials slide easily and rapidly into the drum without poking or pounding. When elevated, bucket is in almost vertical position and does not hinder moving about. Frame is light, scientifically braced and very strong. Control levers grouped so one man loads the drum, tilts and dumps it and attends to engine.

The LITTLE WONDER "FIVE" has capacity of five cu. ft. per batch and turns out 35 to 50 cu. yds. per day without Side Loader. It is famous all over the world as the original small Tilting Drum Batch Mixer. You ought to have it, with or without Side Loader, according to your need. Our "Man to Man" proposition, which includes

Absolutely Free Trial

and easy payments, makes it almost a crime for any man who does concrete work and wants to make money, to be without it. This new combination gives you at low cost a mixer that will do any job that offers, yet is the swiftest and most economical machine for the smallest work. Once you know its simplicity, strength and speed you will not hesitate. It doesn't cost you a cent to find out, because we even pay the freight if you are not satisfied in every particular. Write for our "Man to Man" Proposition.

Canadian Representatives Wanted

Waterloo Cement Mach'y. Corp'n.
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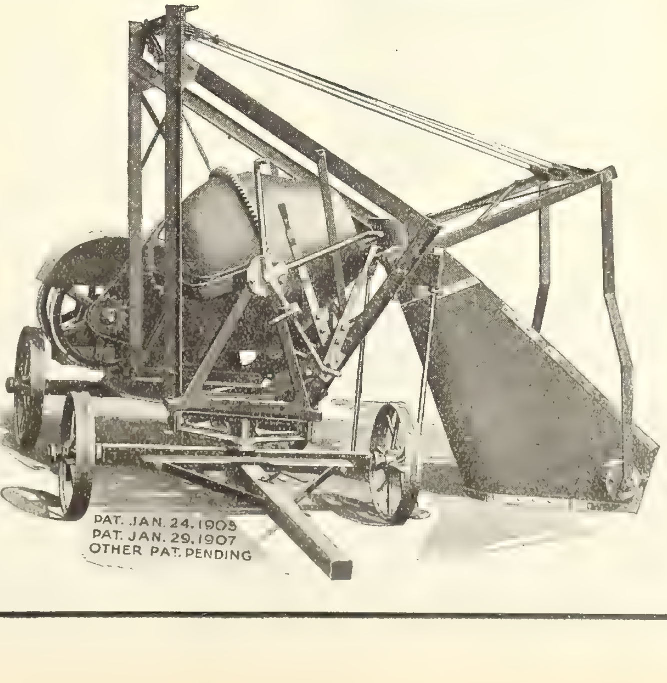
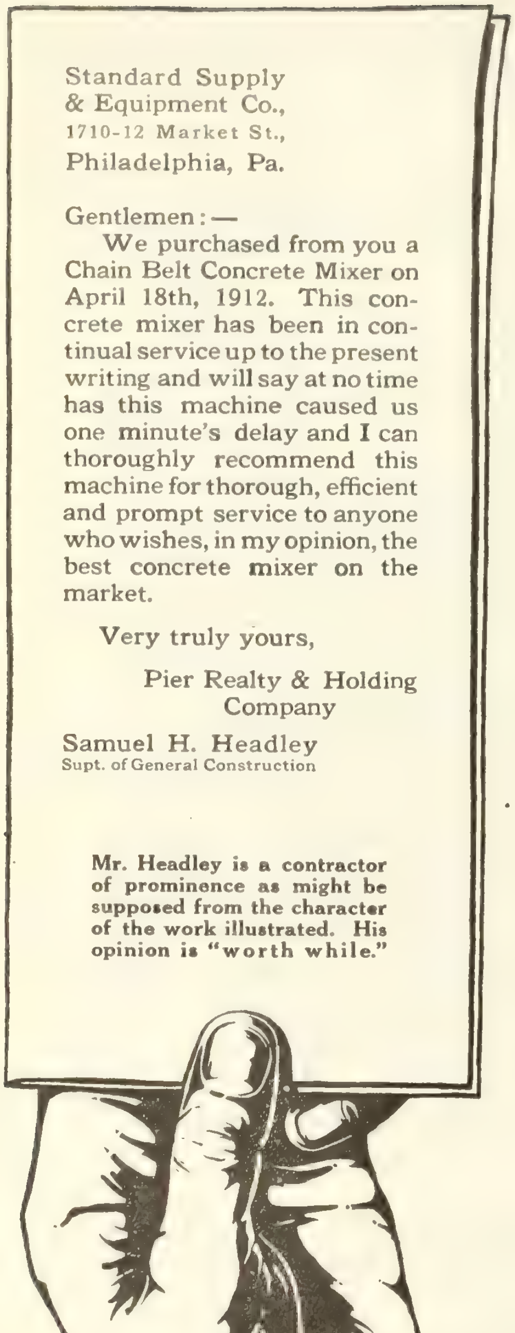
Look at the

Little Wonder "Five"

with the NEW

Side Loader





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Philadelphia, Pa.

Gentlemen: —
We purchased from you a Chain Belt Concrete Mixer on April 18th, 1912. This concrete mixer has been in continual service up to the present writing and will say at no time has this machine caused us one minute's delay and I can thoroughly recommend this machine for thorough, efficient and prompt service to anyone who wishes, in my opinion, the best concrete mixer on the market.

Very truly yours,
Pier Realty & Holding Company
Samuel H. Headley
Supt. of General Construction

Mr. Headley is a contractor of prominence as might be supposed from the character of the work illustrated. His opinion is "worth while."

The Builder of the $500,000 Concrete Pier at Atlantic City Considers the Chain Belt Mixer

"THE MIXER WITH THE BULGE."

The Best Concrete Mixer on the Market

THE mixer was placed in service on the pier project and how well it did the work is shown by the foregoing testimonial.

Work of this character is pretty good evidence of the capacity and efficiency of a concrete mixer. The pier in question extends more than a third of a mile out to sea. The construction, therefore, must be of the most substantial kind. The concrete must be of high grade and of uniform quality. The Chain Belt Mixer was the mixer selected to produce it.

The work must be rapid. The Chain Belt Mixer is one of the lighest-running and fastest machines built. It therefore met that requirement.

There must be no interruptions due to breakdowns, etc. Chain Belt Drive and the Chain Belt Mixer constructions generally are the best possible assurance against breakdowns and loss of time. Hence, the Chain Belt selection on those grounds.

The season will be in full swing almost before you know it. Better order that Chain Belt Mixer now. What size do you require?

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Dominion Equipment & Supply Company,
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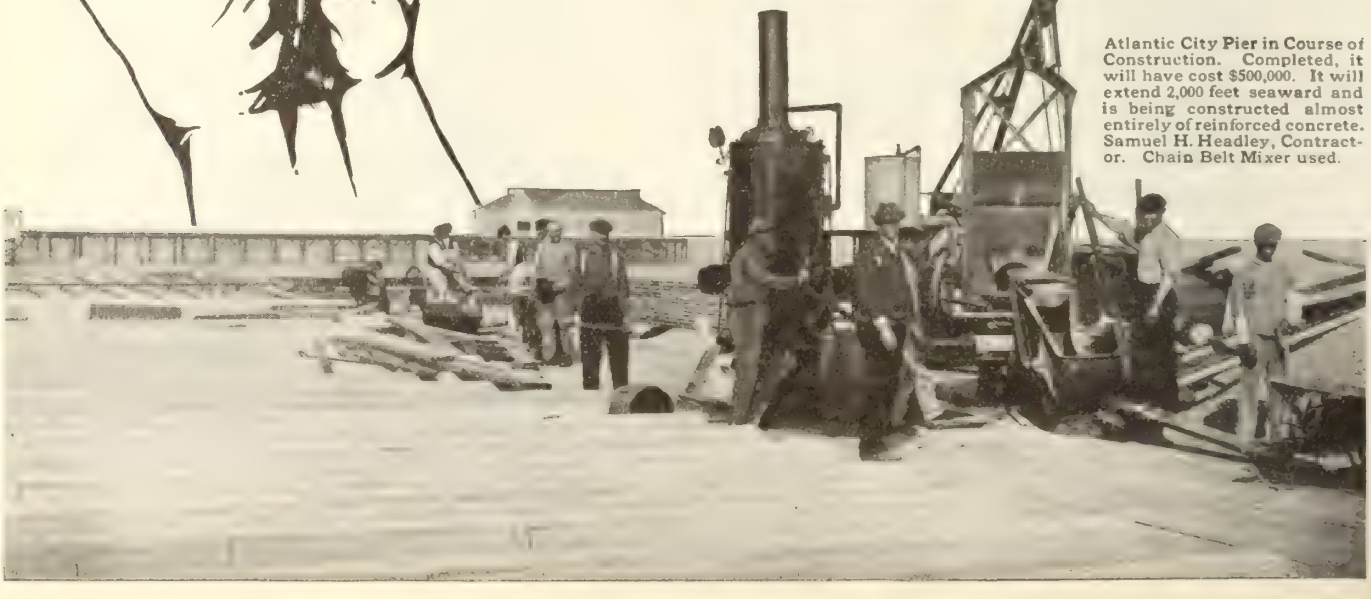

Atlantic City Pier in Course of Construction. Completed, it will have cost $500,000. It will extend 2,000 feet seaward and is being constructed almost entirely of reinforced concrete. Samuel H. Headley, Contractor. Chain Belt Mixer used.

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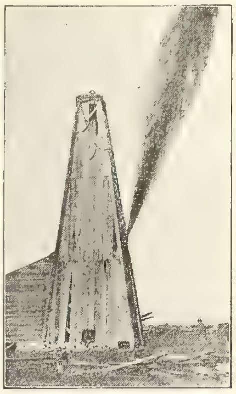

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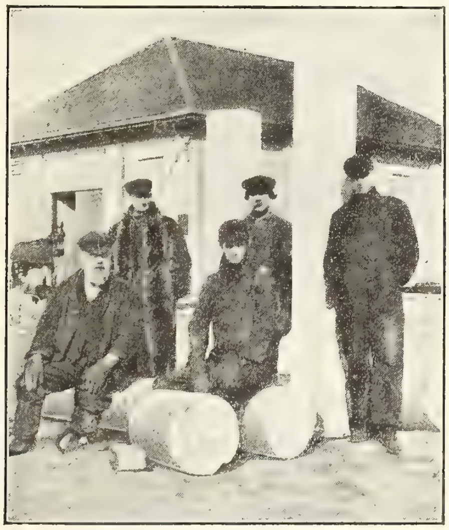

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The 16 in. hard limestone cores shown above were taken out by one of our Type "C" McKiernan-Terry core drills, operated by the Corporation of Winnipeg.
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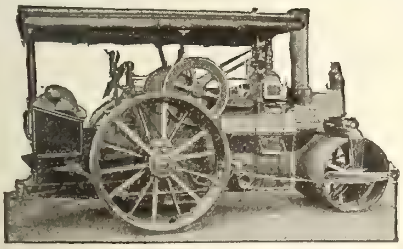

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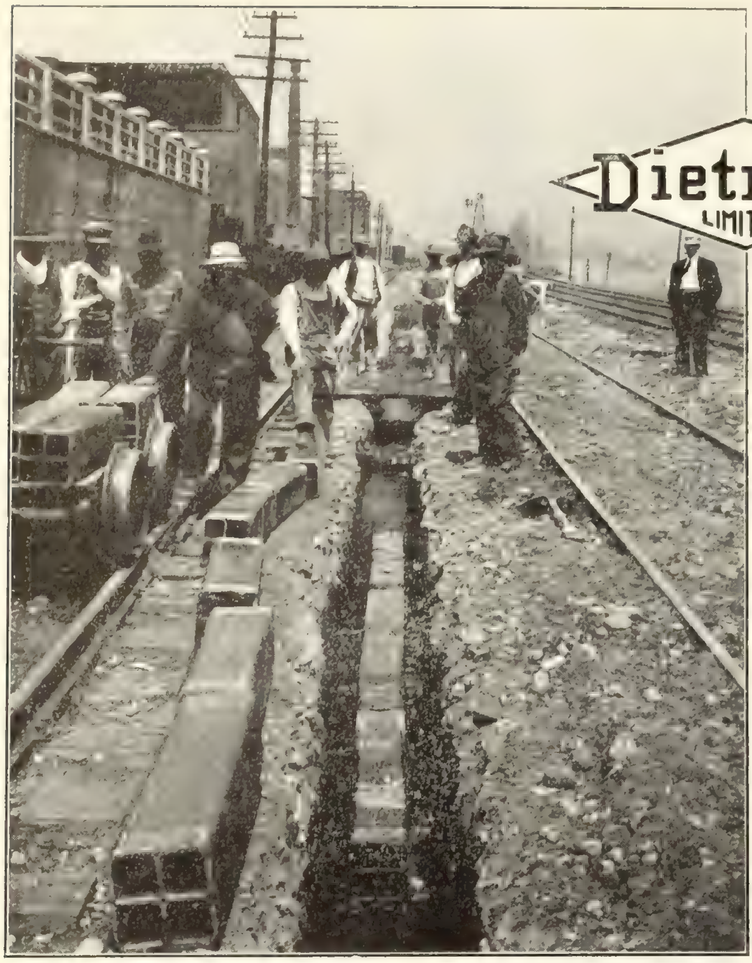

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right and instals them **properly** no matter what natural difficulties may present themselves.

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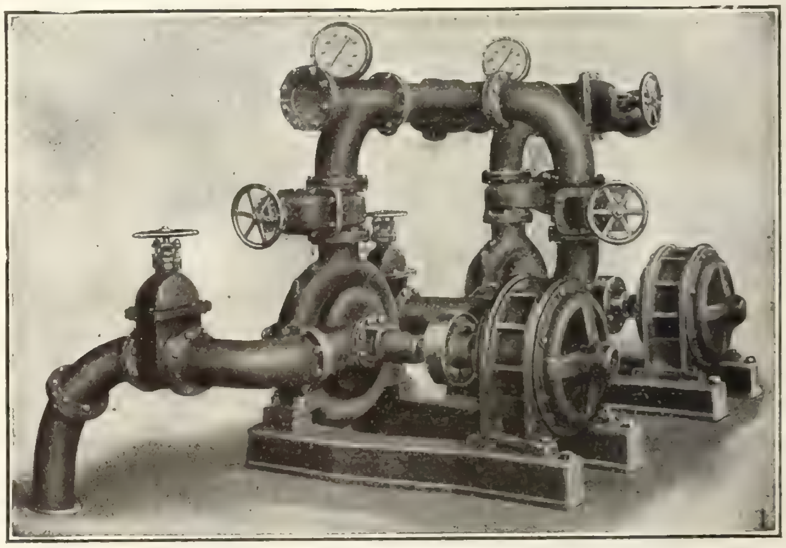

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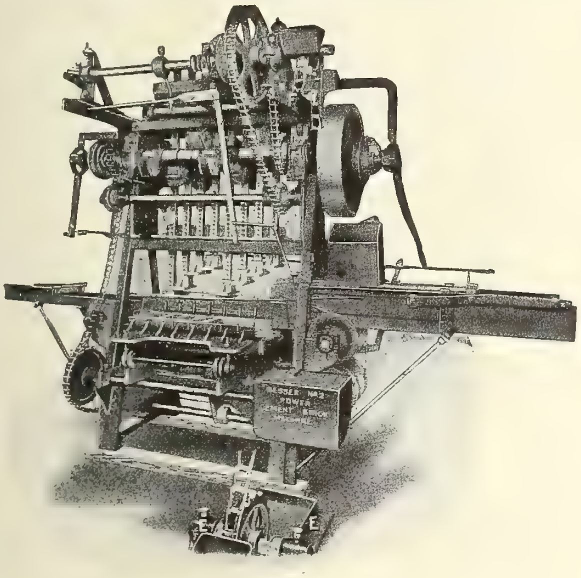

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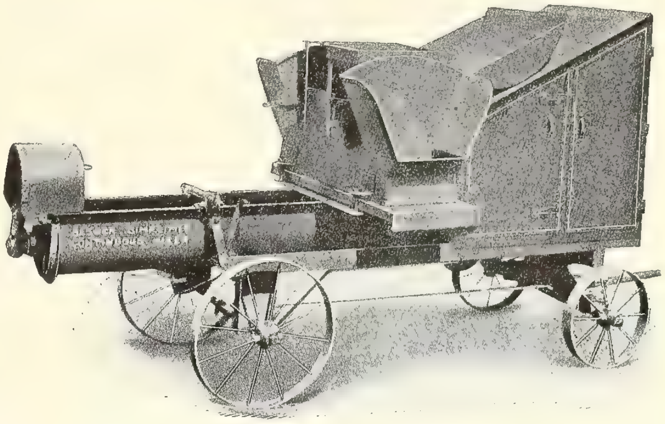

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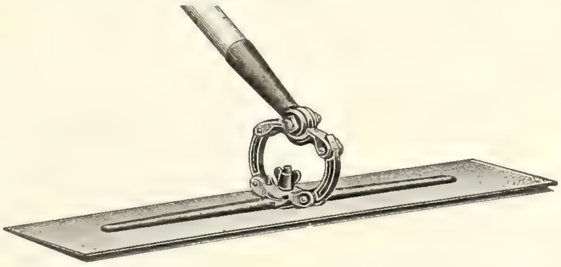

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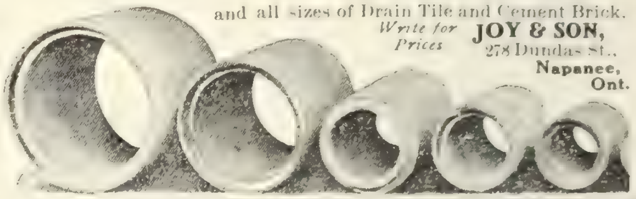

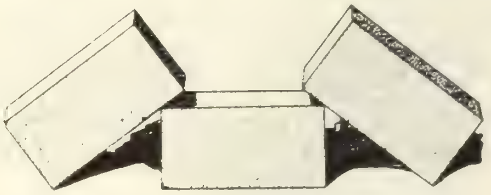

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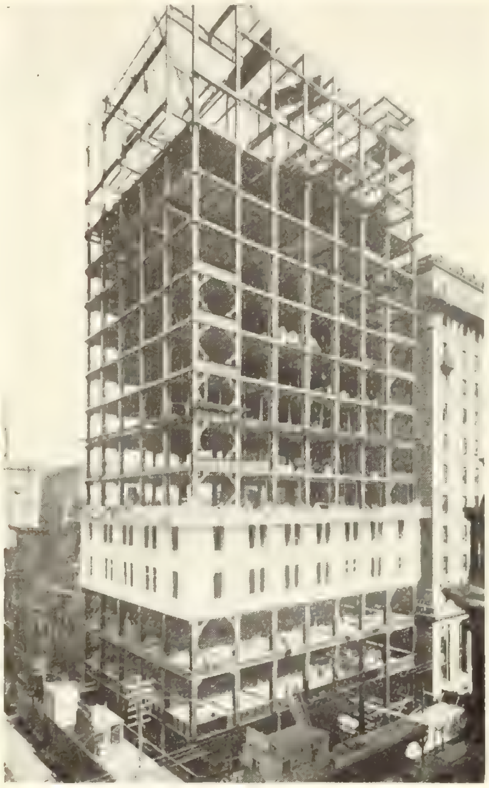

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5,000,000, cu. yds. of Concrete?
The engineers of the Panama Canal had this amount of concrete to mix and after comparative tests they chose **Austin Improved Cube Mixers.**

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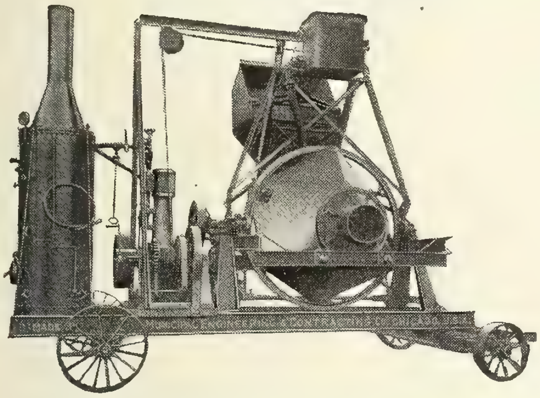

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The contractors for the Detroit River Tunnels had this amount of subaqueous concrete to place and they chose **Austin Improved Cube Mixers.**

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Mix by Kneading

The batch is folded and refolded and squeezed into alternate pyramids and wedges many times each revolution of the cube and every mixing motion is a full batch motion—these are the secrets of rapid mixing and perfect mixing.

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The Doty Marine Engine and Boiler Co.
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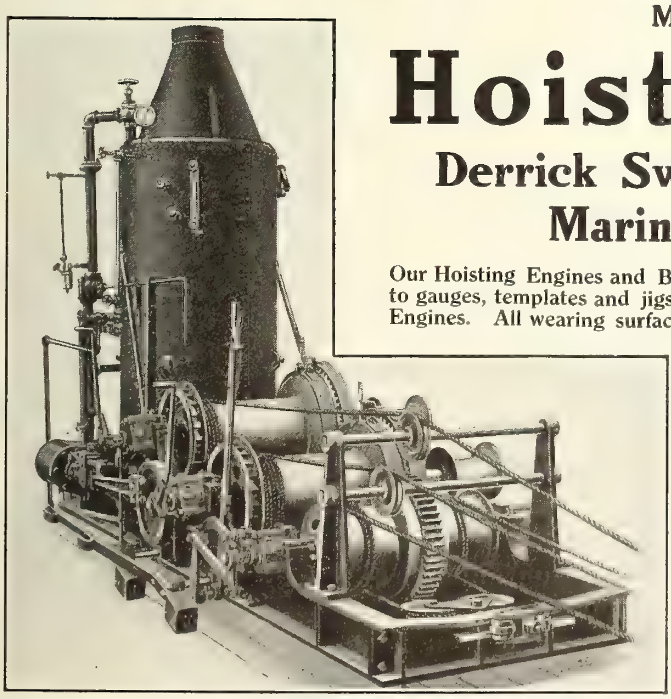

The above half tone illustrates our Standard double Drum double Cylinder Hoisting Engine with Derrick Swinger attached.

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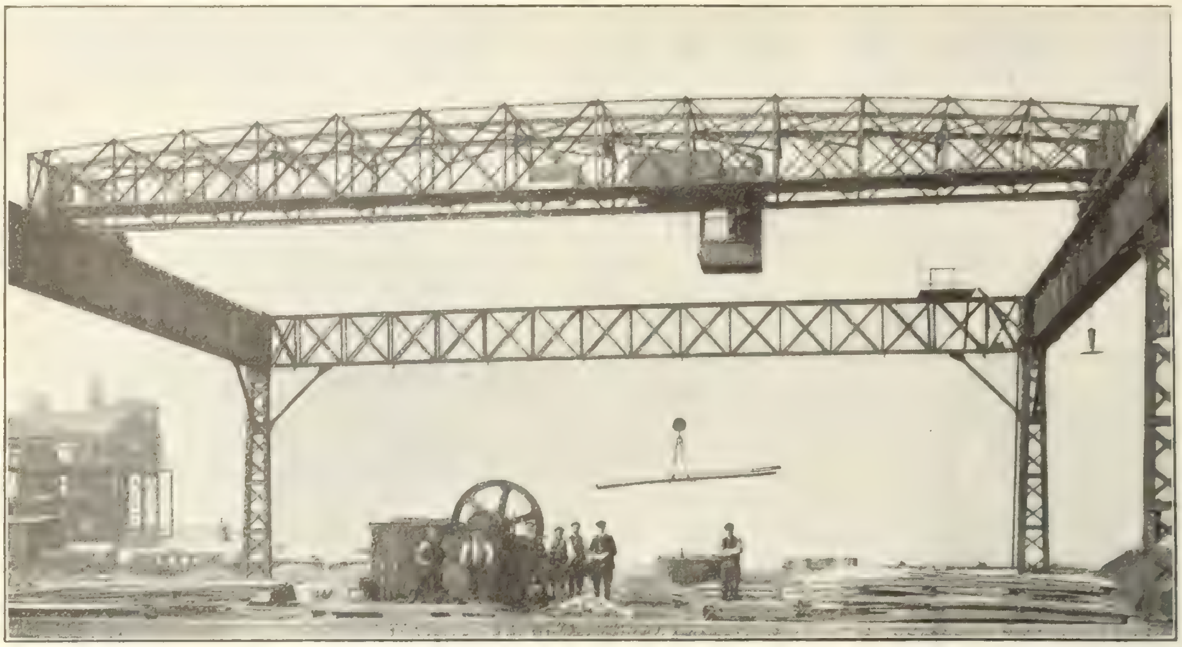

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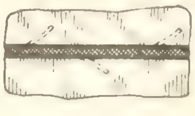
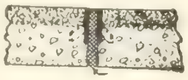


Longitudinal Section Showing Joint.



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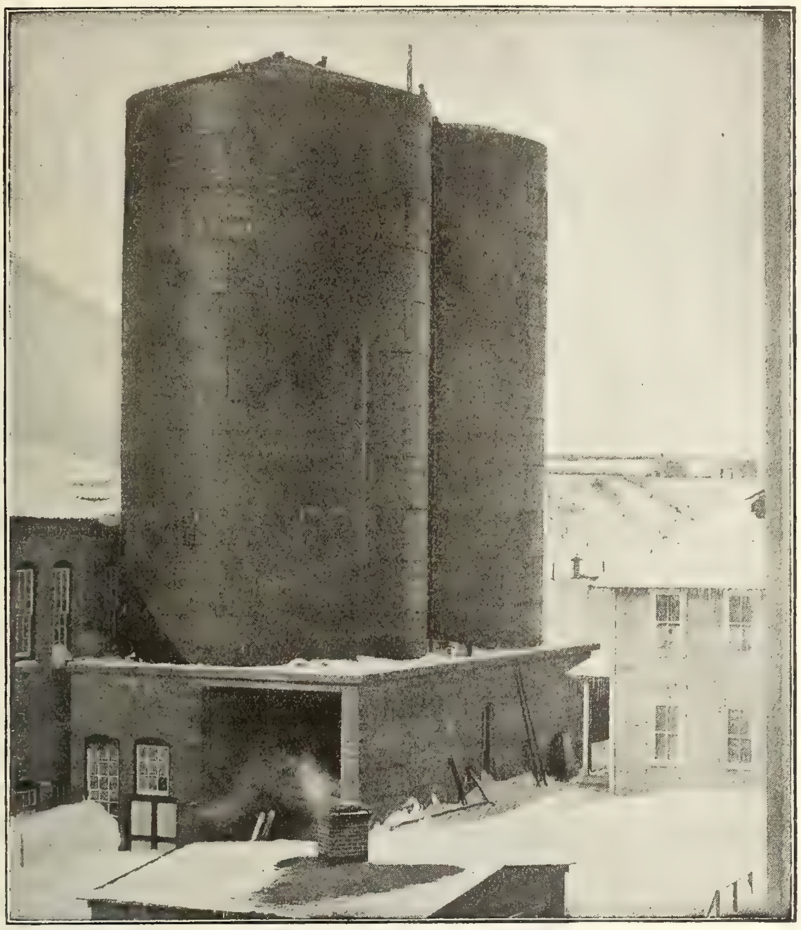

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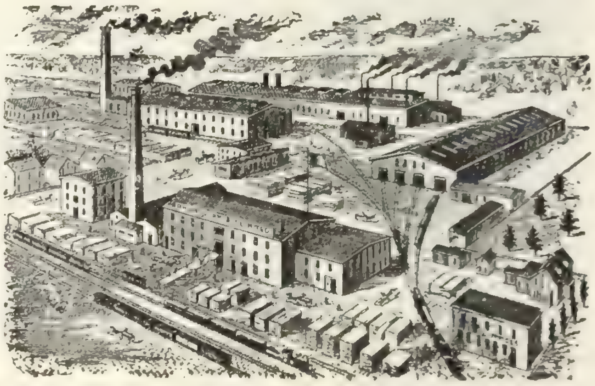

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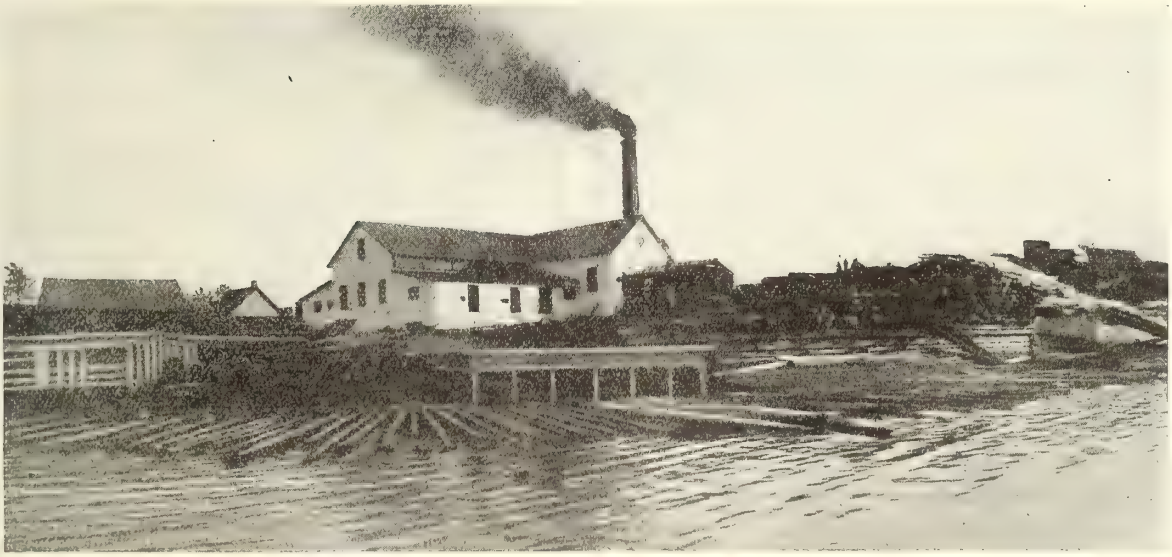

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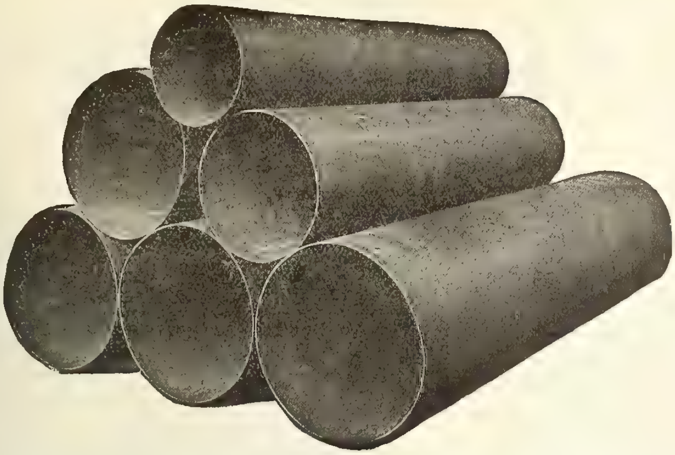

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"TAMCO" Crushed Stone in all sizes, for all purposes. "Roman" building stone. "Milton" pressed bricks. Sanitary flooring, stone crushers, fire engines, &c.

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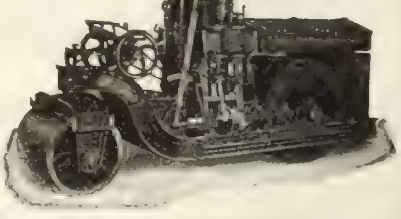

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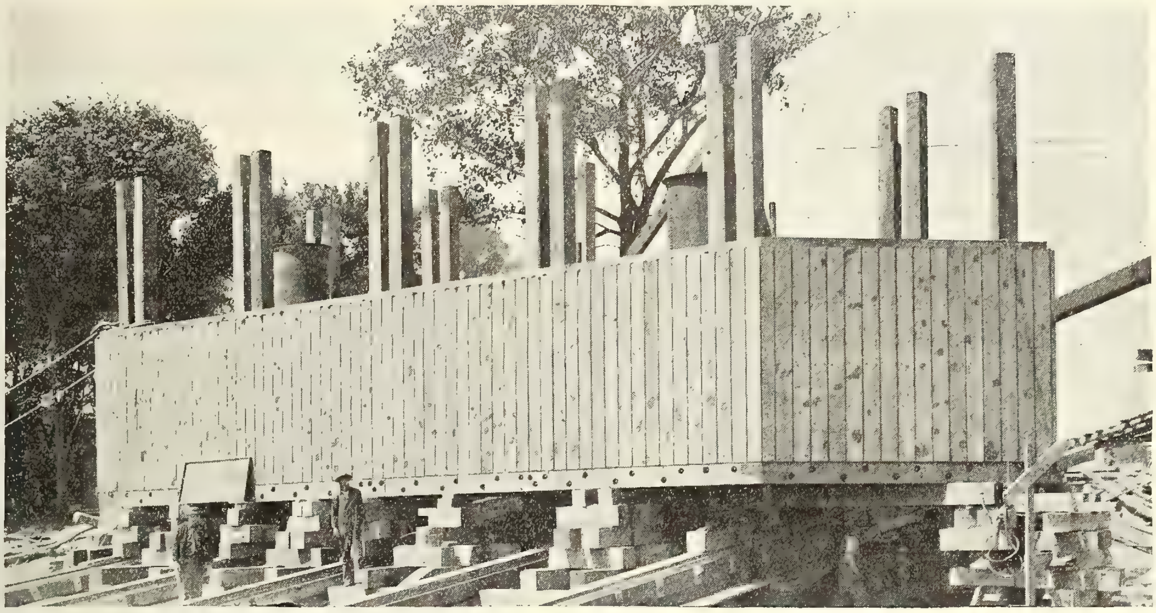

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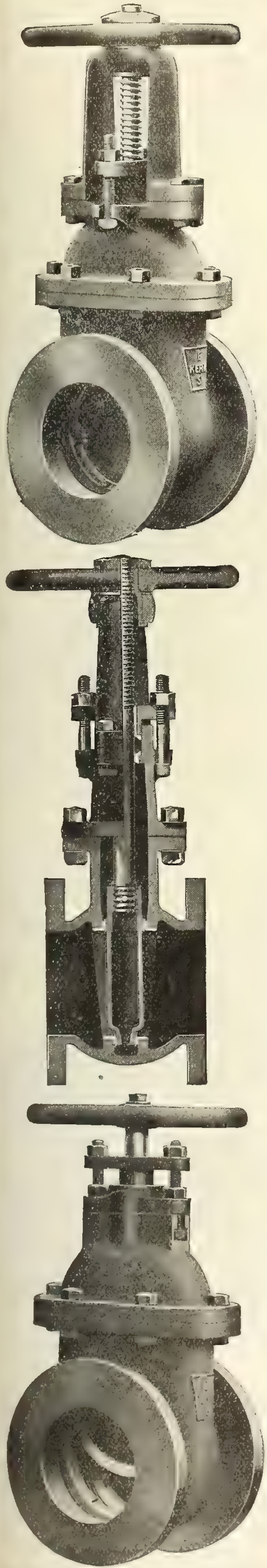

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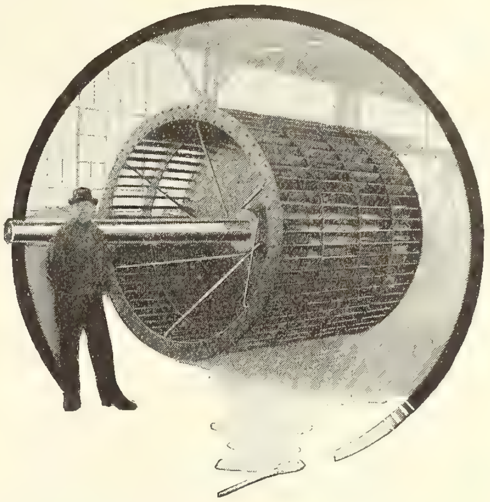

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The illustration shows a double inlet "Sirocco" Fan with a capacity of 270,000 cubic feet of air every 60 seconds at 5″ water gauge.

A "Sirocco" Fan will deliver twice as much air as the ordinary steel plate fan of the same wheel diameter. Save one-half the space and one-third the power.

"Sirocco" Fans and Blowers are made in sizes to deliver from 75 cubic feet per minute to 1,000,000 cubic feet per minute.

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Current Prices of Building Material.

BRICKS

The following are wholesale prices delivered at Toronto:—

	Per M
No. 1 dry pressed red brick	$18 00
No. 1 dry pressed buff brick	18 00
Red Stock Bricks	13 00
Grey Stock Bricks	13 00
Wire cut bricks for foundation work ...	12 50
Porous terra cotta bricks	15 00
No. 1 enamelled bricks, all colors, from	$80 00 to $150 00

LUMBER (Building Material)

Hemlock Lumber—

2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$27 00	
2 x 4 to 2 x 12, 16 ft.	27 00	
2 x 4 to 2 x 12, 18 ft.	26 00	30 00
1 in. Hemlock, No. 1	26 00	28 00
No. 1 Hemlock Decking	24 00	28 00
No. 2 Hemlock dimension and 1-in.	20 00	22 00

Pine—

1 in. common pine 8 to 12 in. wide rough	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
⅞ x 8 and 10 in. pine shelving..	36 00	42 00
⅞ x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine desking D2S	30 00	
Spruce Decking	28 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

Pine trim for paint finish—

4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8-in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

Shingles—

XXX B. C. Clear Shingles, per M.	3 90
N. B. Extras	3 75
N. B. Clears	3 10
No. 1 pine lath, per M.	5 00
No. 2 pine lath	4 50
No. 1 spruce lath	4 00

Cedar Posts—Fence—

5 in. at small end, each	30
7 in. at small end, each	35
Hemlock lath	3 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

	Star	D.D.
10 to 25 united inches	$4 25	$ 6 25
26 to 40 "	4 60	6 75
41 to 50 "	5 10	7 50
51 to 60 "	5 35	8 50
61 to 70 "	5 75	9 75
71 to 80 "	6 25	11 00
81 to 85 "	7 00	12 50
86 to 90 "		15 00
91 to 95 "		17 50
96 to 100 "		20 50
101 to 105 "		24 00
106 to 110 "		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for box lots:—

MONTREAL

	Star	D.D.
25	$3 25	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
90		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 u.i.	$3 50	$5 00
26/40	3 75	5 50
41/50	4 25	6 25
51/60	4 75	7 00
61/70		8 00
71/80		9 00
81/85		10 00
86/90		11 00
91/95		13 00
96/100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

STEAM FITTERS' AND PLUMBERS' SUPPLIES

Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock ...... net $1.85

No. 4½ Fuller's .... net $2.50

Square head brass cocks, 65 per cent.

Lead Pipe

Lead pipe, $7.50, less 10 per cent.; lead waste, $9.00, less 10 per cent.; caulking lead, 6¾ cents per lb.; traps and bends, 35 per cent.; pig lead, 5¾ cents per lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.28	¼ inch	$3.18
⅜ "	2.28	⅜ "	3.18
½ "	2.72	½ "	3.57
¼ "	3.28	¾ "	4.43
1 "	4.85	1 "	6.55
1¼ "	6.56	1¼ "	8.86
1½ "	7.84	1½ "	10.59
2 "	10.55	2 "	14.25
2½ "	16.67	2½ "	22.52
3 "	21.80	3 "	29.45

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

Soil Pipe and Fittings

Medium and extra heavy pipe and fittings, up to 6-inch, 60 and 5 per cent.

7 and 8-inch pipe, 45 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

CEMENT, STONE, STEEL, Etc.

Cement, barrel lots, in bags, delivered, Toronto, bags extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ⅜-inch, $1.45.

Burnt River rubble stone delivered, $17 to $18 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¾ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

Free stone delivered, $17 to $18 per toise.

Brown coursing stone, delivered, $3.75 per yard.

Grey coursing stone, delivered, $2.50 to $2.75 per yard.

Sand, for cement or brick work, $1.15 a cubic yard, f.o.b. Toronto, C. P. R. sidings.

Sand, for cement or brick work, 90c to $1.05 a cubic yard, f.o.b. Toronto, G. T. R. sidings.

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

Steel channels and beams, $2.65 to $3.00 per 100 pounds, delivered f.o.b. Toronto.

Hard Wall Plaster, unsanded, from $7.00 to $8.50, bags extra; sanded, $4.50 in car lots; hydrated lime, $9.00 in car lots.

Lime, per cwt., delivered, not less than 1,500 lbs. 33 cents; white, 43 cents.

Plaster of Paris, Anchor and Crown Brands, $1.50.

Manilla Rope, best, per pound, 12½ cents.

PAINT AND OILS

Pure White Lead, ground in oil, $8.50 per 100 lbs.

Boiled Linseed Oil, in bbls., 63c. per gal. of 9 lbs.

Raw Linseed Oil, in bbls., 60c. per gal. of 9 lbs.

Turpentine, in barrels, 60c. per gallon.

Pure Red Lead, dry $6.50 to $7.50 per 100 lbs.

Putty, pure linseed oil, in bulk, bbls., 3½c.

Putty, pure linseed oil, in 25-lb. tins, 4c.

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A system that improves the concrete and reduces the cost.

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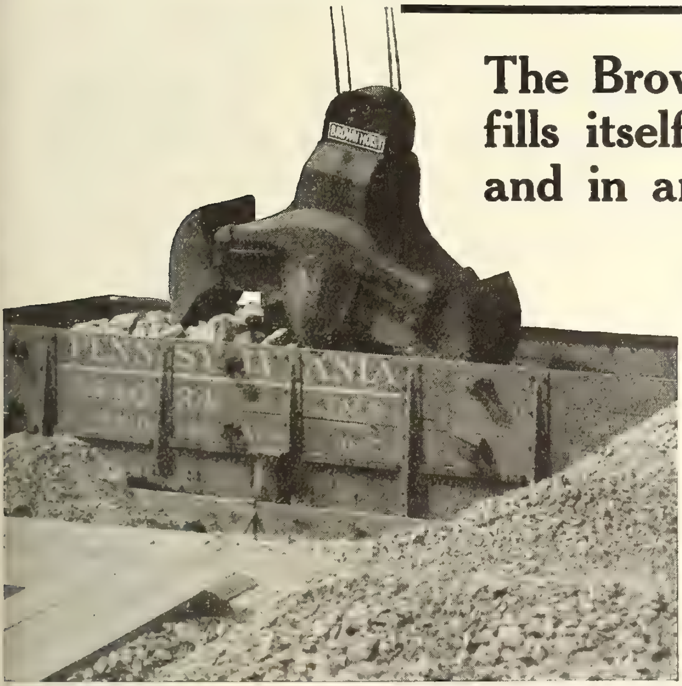

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The spades are so shaped that when digging, the material gathered causes the bucket to dig deeper into the material insuring a full load.

And when digging, the bucket is prevented from skidding over any lumps

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and by the high closing power of the bucket.

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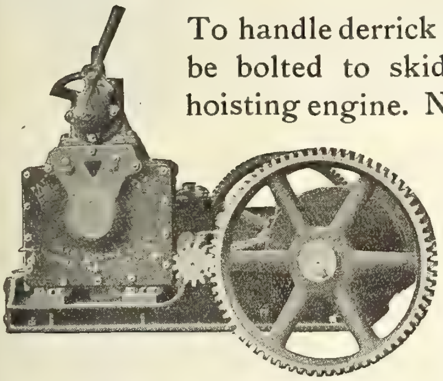

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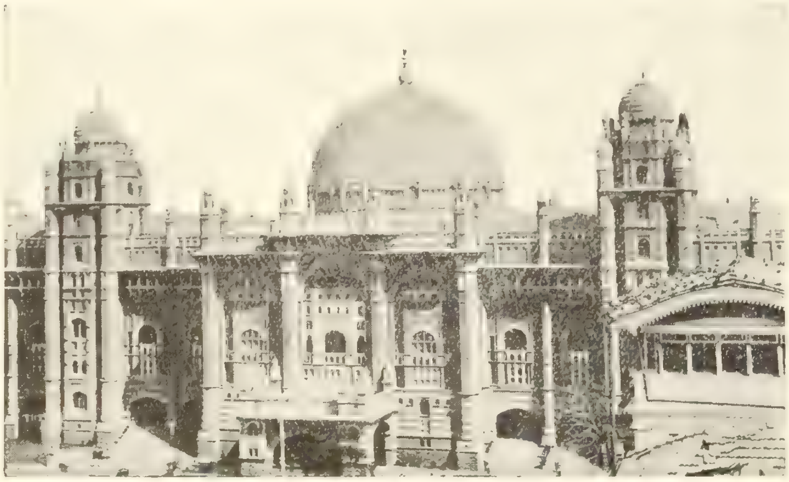

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Makes Concrete Permanently Watertight

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This letter would not reach us if Ceresit was not a satisfactory cement waterproofing.

THE SILVER BAY ASSOCIATION
New York, Nov. 27, 1912

Ceresit Waterproofing Co., Chicago

My dear Sir—

Regarding the Ceresit which we purchased from you last spring.

The water supply for the Silver Bay Property is pumped from a Mountain Lake to a reservoir 50x100 with a capacity of 11,000 barrels. After the reservoir had been in use for a little time, leaks were discovered which we were unable to check. Last spring Ceresit was used and while the reservoir was used all summer no leaks appeared. We are fully convinced that Ceresit is the proper waterproofing.

Very truly yours,
C. F. Cooper.

CERESIT WATERPROOFING CO.
Commercial Bank Bldg., CHICAGO.

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Grose & Walker Ltd., 259 Stanley St., Winnipeg.
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Carritte-Paterson Co.,Ltd., St. John, N.B.
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Ceresit is sold all over the world in barrels, and five and ten gallon jacketed cans labeled with our name for identification. CERESIT is catalogued in "Sweet's" Index. Agents wanted in unoccupied territory.

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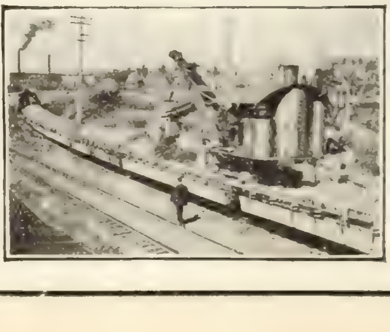

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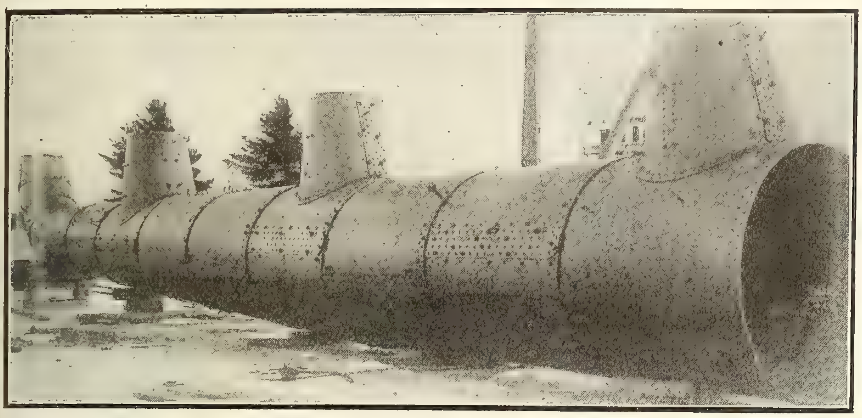

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Drummondville, Que. Holyoke, Mass.

Mahan & Company

908-909 Chamber of Commerce Building
Chicago, Ill.

Block, Sawed, Planed and Turned

Bedford Stone

Quarries and Mills
near Clear Creek, Indiana

Chicago Mill and Storage Yard:
2126-2142 So. Kedzie Ave. and C. B. & Q. Tracks

Representative, Toronto, Canada,
H. R. IVOR, Rooms 8-10, No. 34 Yonge Street

Producers of the Celebrated

"Peerless" Bedford Stone

Bedford Indiana Limestone

Mill Blocks
Sawed, Planed and Turned Stone

W. McMILLAN & SON
(Incorporated)

General Offices
918 Otis Building
CHICAGO, ILL.

Quarries and Mills { Bedford, Ind. Bloomington, Ind.

THE H. & E. PATENT BALL-BEARING LIFTING JACKS

For Railway and Bridge Work, Contractors' and Builders' Use

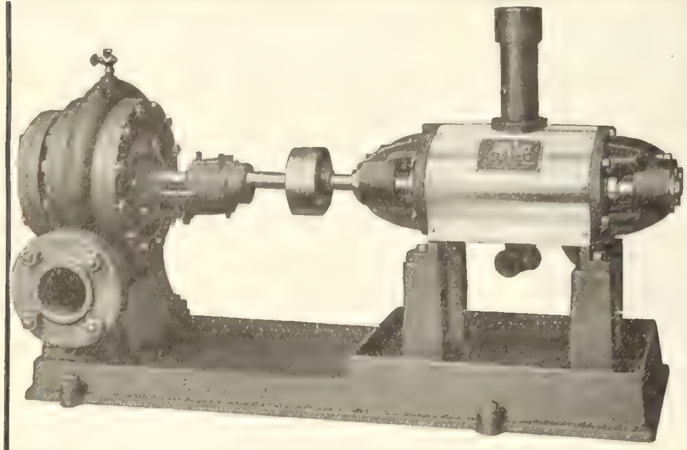
Made by practical Jack Builders. Material: best grades of malleable iron and steel Fully guaranteed as to durability and efficiency. The long even stroke of the lever together with the design and careful construction of the jack, makes it the quickest and easiest working lifting appliance on the market. Made in plain and foot-lift styles. Adapted to all classes of work where a lifting jack can be used. Sizes from 8 to 50 tons capacity now complete. Send for prices and discounts.

To any responsible Firm or Railway in Canada any of these jacks will be sent on 30 days trial.

MANUFACTURED BY

Canada Lifting Jack Co., Ltd.
(Formerly the H. & E. Lifting Jack Co.)
Waterville, Que.

Stock carried by F. H. Hopkins & Company, Montreal



The new factor in Pumping Cost.

The remarkable performance of the Spiro turbine as applied to centrifugal pump drive, merely proves the old truth about the cardinal virtue of simplicity.

A gas producer yields a horsepower from the smallest quantity of coal, yet a steam operated Spiro-Centrifugal pumps a gallon of water at a much smaller total cost, figuring attendance, depreciation, investment and fuel combined.

Over and above this, the Spiro-Centrifugal has set up a new standard in continuity of operation, and by its almost total absence of repair cost.

"Buffalo" SPIRO-CENTRIFUGAL PUMPS

No one dreamed that a pair of plain herring-bone gears could be made into an engine or turbine before the advent of the Spiro. This new principle is revolutionary and has reduced prime mover construction to what would seem the limit of simplicity, service and economy combined. Not a single blade, nozzle or valve in the entire unit. Just a pair of herring-bone gears enclosed in a cylinder, with a jet of steam blown against them.

Ask for new 84-page catalog No. 225, and investigate the wonderful adaptability of the Spiro for direct connection to Pumps, Fans, Generators and machinery used in mining, quarrying and other pursuits.

Buffalo Steam Pump Co.

Sole Canadian Agents—

CANADIAN BUFFALO FORGE CO.
Montreal Limited
St. John Toronto Winnipeg Vancouver

Structural Water-proofing

"DEHYDRATINE"
For Water-proofing under the membranous method.

"HYDRATITE"
For Water-proofing Concrete.

"FERRO FAX"
For Surface Hardening Concrete Floors.

"SYMENTREX"
A Cement Coating—Makes Surfaces Water Shedding.
MADE IN COLORS

"These Trade Names protect you against the possible selection of inferior materials. Whether you prefer a water-proof paint or a compound, we can give you satisfactory assurance as to the reliability of these products."

"FOR 15 YEARS STANDARD OF THEIR KIND."

Pinchin-Johnson & Co.
(Canada) Limited
Minerva House, - Toronto
Write for Particulars and Architect's Hand Book (1913 edition)

AGENCIES IN ALL CITIES

JACKS

For Every Lifting Purpose

"The Jacks that Duff Builds" are designed to give perfect satisfaction, and are noted for their durability, reliability, and easy, convenient operation.

Genuine BARRETT Track Jacks
Genuine BARRETT Automatic Lowering Jacks
DUFF Ball-Bearing Screw Jacks
DUFF-BETHLEHEM Forged Steel Hydraulic Jacks

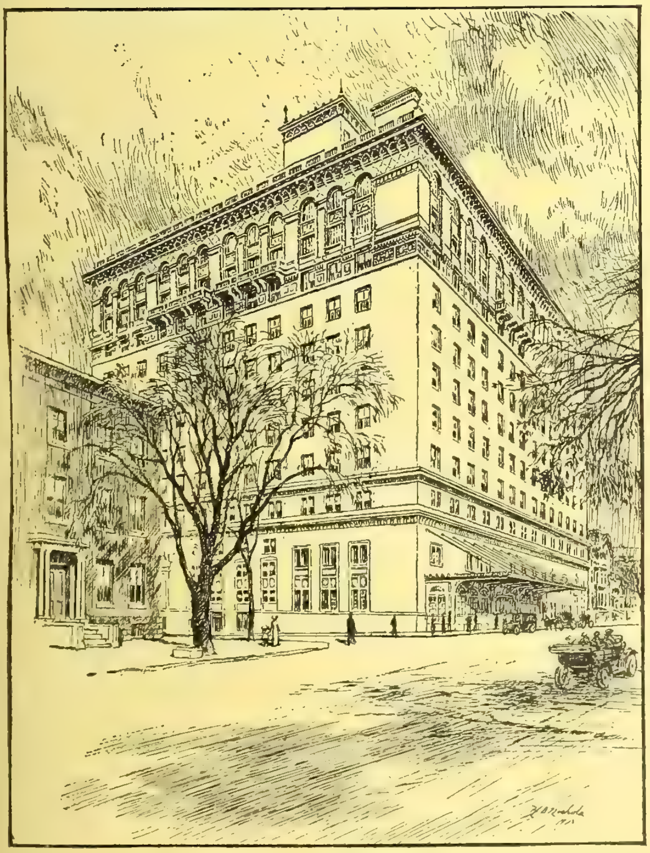
Capacities from 1,500 lbs. to 500 tons and a wide variety of styles and heights, insures the selection of the proper jack for any requirement.

Ask for Catalog No. 15 *Sole Agents for Canada*

The Canadian Fairbanks-Morse Co., Limited

MONTREAL OTTAWA ST. JOHN TORONTO WINNIPEG
CALGARY SASKATOON VANCOUVER VICTORIA

3



Across Canada with the Imperial Wire & Cable Company, Limited

Toronto Montreal Winnipeg

First of a series of advertisements showing buildings of national importance which have been wired with Imperial Wire & Cable Co.'s, Limited, wires.

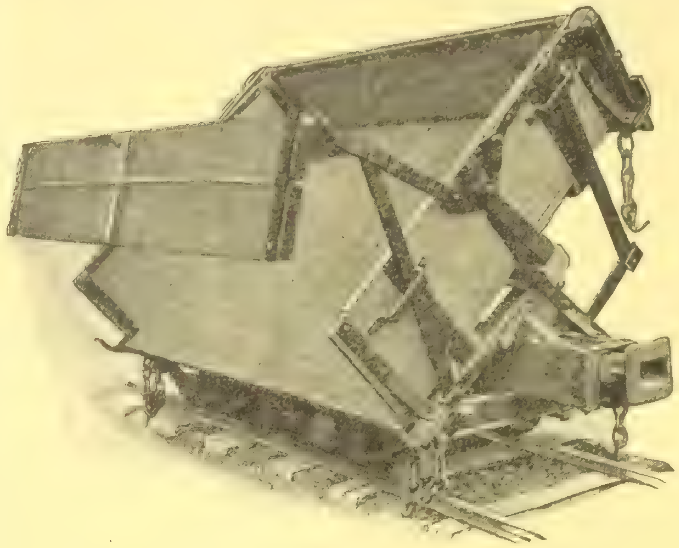
This picture shows

The Ritz-Carlton Hotel, Montreal

Architects—Warren & Wetmore—New York.
Engineers—Mailloux & Knox—New York.
Electrical Contractors — J. Livingston & Co. —New York.

This hotel was wired with "Imperial" Higrade Rubber Insulated Wire.

Address enquiries to nearest office, Montreal, Toronto, Winnipeg; Alberta and British Columbia enquiries to Northern Electric & Manufacturing Co., Limited, Calgary and Vancouver.



"KILBOURNE
&
JACOBS"

Dump Cars

Our Dump Cars will give you entire satisfaction. We can supply cars in all capacities for any practical gauge. Wheels are all properly chilled and the construction and material used are the best.
Our Cars are declared by steam shovel and car men to be superior to all others, both in construction and operation.

Let us have your enquiry, we would be pleased to submit full particulars and prices at any time.

"Davenport" Saddle Tank Locomotives

For Contractors and Quarry Service

Supplied in any size for any practical gauge track.

"Marion" Steam Shovels

For Railroads — Contractors — Brickyards, Etc.

We supply Steam Shovels in all sizes. Can furnish both Standard and Revolving types. Write us stating your special requirements and we will be pleased to submit proposition.

F. H. Hopkins & Co.

MONTREAL

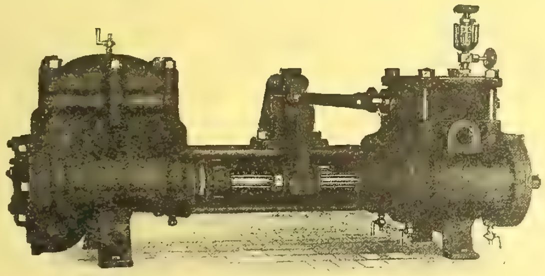
BRANCH OFFICES: **General Supply Company of Canada, Ltd., Winnipeg Agents**
Ritchie Contracting & Supply Company, Ltd., Vancouver Agents

Vol. 27 Toronto, July 30, 1913 No. 31

Contract Record and Engineering Review

ESTABLISHED 1886

Steam and Power Pumps, Condensers and Travelling Cranes



The Smart-Turner Machine Co. LIMITED
HAMILTON, CANADA

"MADE IN CANADA"

Bent Glass

Made in all Kinds of Glass on Short Notice

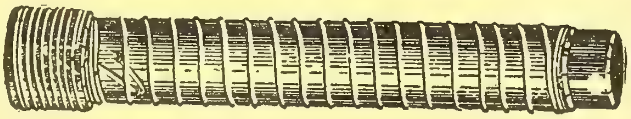
Large Bent Plate Glass for Shop Fronts a Specialty

The Toronto Plate Glass Importing Company, Limited
(HILL & RUTHERFORD, Managing Directors)
Head Office and Works : 91 to 133 Don Roadway
TORONTO

Air Compressors
OF BELLISS MAKE
have gained their reputation for

- Simplicity of Design
- Noiseless Running
- Compact Design
- Low Oil Consumption
- Continuous Operation
- Overall Efficiency

Messrs. Belliss & Morcom, Ltd.
BIRMINGHAM, ENGLAND
Agents
Laurie & Lamb
Board of Trade Building, MONTREAL



Continuous and Machine Banded Wood Stave
WATER PIPE
RESERVOIR TANKS
for city and town Water Systems, Fire Protection, Power Plants, Hydraulic Mining, Irrigation, etc. One-half the cost of Iron Pipe—and better.

Pacific Coast Pipe Co., Limited
P. O. Box 563 Vancouver, B. C.
Office and Factory, Granville St., near High Bridge
WRITE FOR CATALOGUE
Full Particulars and Estimates Furnished

Alphabetical Index of Advertisers, Page 16 Classified Directory to Advertisements, Page 6

Rock Crushing Plants

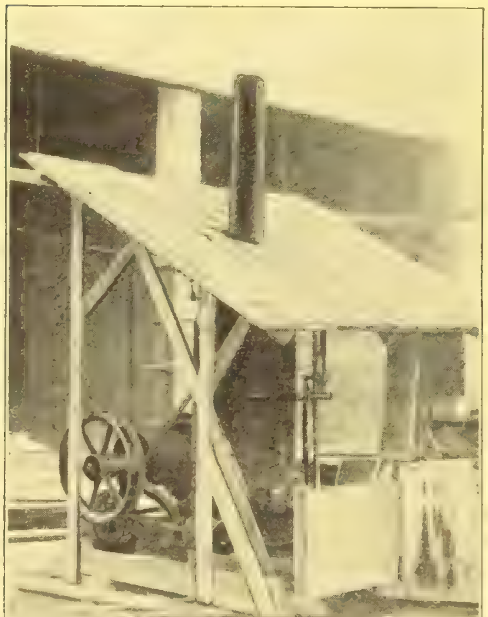
Complete, Self-contained, Portable Crushing, Grading and Loading Plant

The adaptability of the above plant, the ease with which it can "follow the job" makes it an ideal outfit for the Contractor. It is only one of our many combination machines for crusher work.

Full details of the various parts will be gladly furnished by any of our offices.

THE JENCKES MACHINE COMPANY, LIMITED

Sherbrooke St. Catharines Montreal Cobalt
South Porcupine Vancouver Nelson



This "AMERICAN" Engine Has Been On The Job Steadily For 20 Years— And it is Still There.

In 1893 it won a Blue Ribbon at the Chicago World's Fair and ever since it has been busy demonstrating that the honor was well deserved.

For almost a quarter of a century it has been helping its owner, a southern contractor, finish his jobs ahead of time and to-day it looks fully capable of keeping up the good work for twenty years more.

That's a pretty good record of efficiency, durability and economy. It's the kind of a record "AMERICAN" Engines are making every day everywhere.

Made by

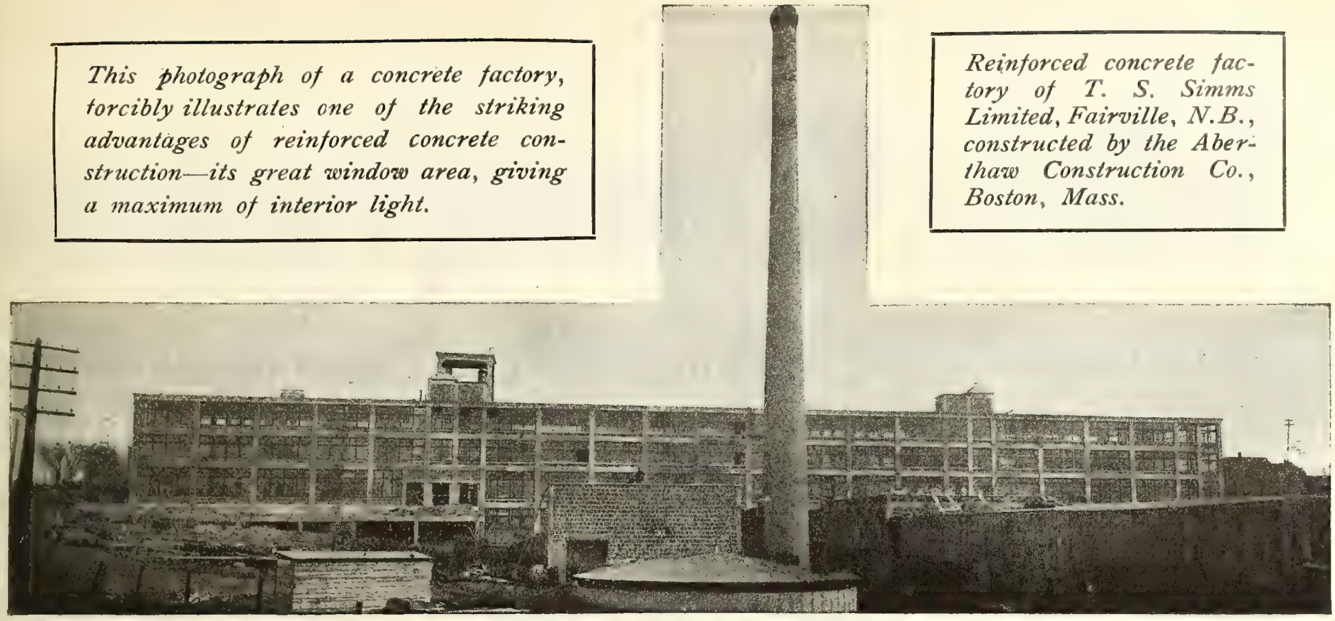
AMERICAN HOIST & DERRICK COMPANY
ST. PAUL, MINN., U.S.A.

Sold by

General Supply Co., of Canada, Ltd., Montreal, Ottawa, Toronto, Can.
Stuart Machinery Co., Winnipeg, Man.
Vancouver Machinery Depot, Ltd., Vancouver, B.C.
Gorman, Clancey & Grindley, Edmonton and Calgary, Alta., and Nelson, B.C.

This photograph of a concrete factory, forcibly illustrates one of the striking advantages of reinforced concrete construction—its great window area, giving a maximum of interior light.

Reinforced concrete factory of T. S. Simms Limited, Fairville, N.B., constructed by the Aberthaw Construction Co., Boston, Mass.



Concrete Factories are Most Efficient

The efficiency of a machine is the ratio of the amount of work a machine does to the amount of work required to operate it. The output is equal to the input minus the work lost or wasted. The less wasted the greater the efficiency.

In the same way the efficiency of a factory may be defined as the ratio of output to input. Output financially, is increased by reducing unnecessary expenses.

Concrete Stops Wastes

Concrete buildings are proof against fire, water and vermin. They give the maximum light and are sanitary. They resist vibration, and are permanent and durable.

Fire-proofness reduces insurance rates. Water or liquids used in certain processes will not leak through floors to destroy valuable goods below. Rats and other vermin find no place to live in a concrete building, thus eliminating losses from this cause. Maximum light and sanitary conditions increase efficiency of employees. Lack of vibration reduces wear and tear on machines. Permanency and durability reduce depreciation.

The way in which concrete stops these leaks is fully described in our handsomely illustrated 224 page book, "Factories and Warehouses of Concrete." It contains photographs and data of factories and warehouses for all classes of industries.

You can have a copy free if you will mention this advertisement.

Canada Cement Company
Limited
Montreal

Mr. Contractor!

Do you realize you cannot compete in city work without a revolving shovel? The man with the shovel can finish many jobs while the man with the old fashioned methods is still on one. He has less labor trouble. He can accomplish more. He makes a bigger profit.

Bucyrus Revolving Shovels

Reduce Your Costs

Are especially adapted for doing foundation and road cellar work. They contain features which put them entirely in a class by themselves, and which it would pay you to investigate.

SEND FOR LITERATURE

Montreal, 318 St. James St.
Toronto, 155 West Richmond St.
Cobalt, opp. Right of Way Mine.
Winnipeg, 259-261 Stanley St.

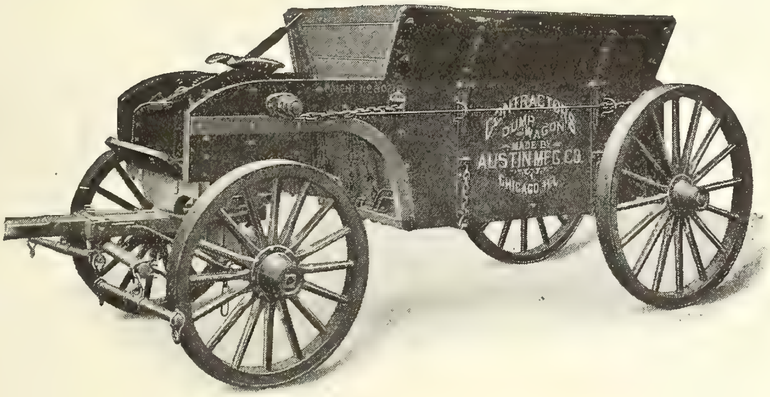
MUSSENS

Austin Dump Wagons

will not stall on the dump

The bottom boards raise automatically up the outside of the wagon box and oscillate in any direction, making it impossible to get stuck on the dump.

AUSTIN Contractors Dump Wagon has the shortest wheel base which gives lightness of draught and strength.



The load is carried close to the axles and to the power.
Though low and short, it has greater clearance beneath it.

Automatic steel arms serve to raise the doors, when dumped, and to finally wedge them in place when loaded.

Complete, clean and rapid discharge.

May be dumped and brought back into loading position by a single lever which is operated by one hand without stopping.

LIMITED

Calgary, 10th Ave. & 3rd St. E.
Vancouver, 365 Water Street
Quebec, 71 Maple Ave.
St. John, N.B., 57 Smythe St.
Halifax, 78 Granville St.

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The following regulations apply to all advertisers:—Eighth page, two headings quarter page, four headings; half page, eight headings; full page, sixteen headings.

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  - Canadian Fairbanks-Morse Co.
  - Can. Ingersoll-Rand Co., Ltd.
  - Escher Wyss & Co.
- Architects
  - Weeks, Arthur L.
- Architects' Instruments
  - Stanley Co., W. F.
  - Ainsworth & Sons, Wm.
  - W. & L. E. Gurley.
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  - Canadian Allis-Chalmers, Limited.
  - Canada Wire & Iron Goods Co.
  - Dennis Wire & Iron Works.
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- Architectural Metal Work
  - Feather & Roadhouse.
  - Ormsby Co., Limited, A. B.
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  - Canadian Concrete Appliance Co.
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  - Boving Company of Canada.
  - Escher Wyss & Co.
  - Pittsburgh Valve, Foundry & Construction Company.
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  - Jenckes Machine Co.
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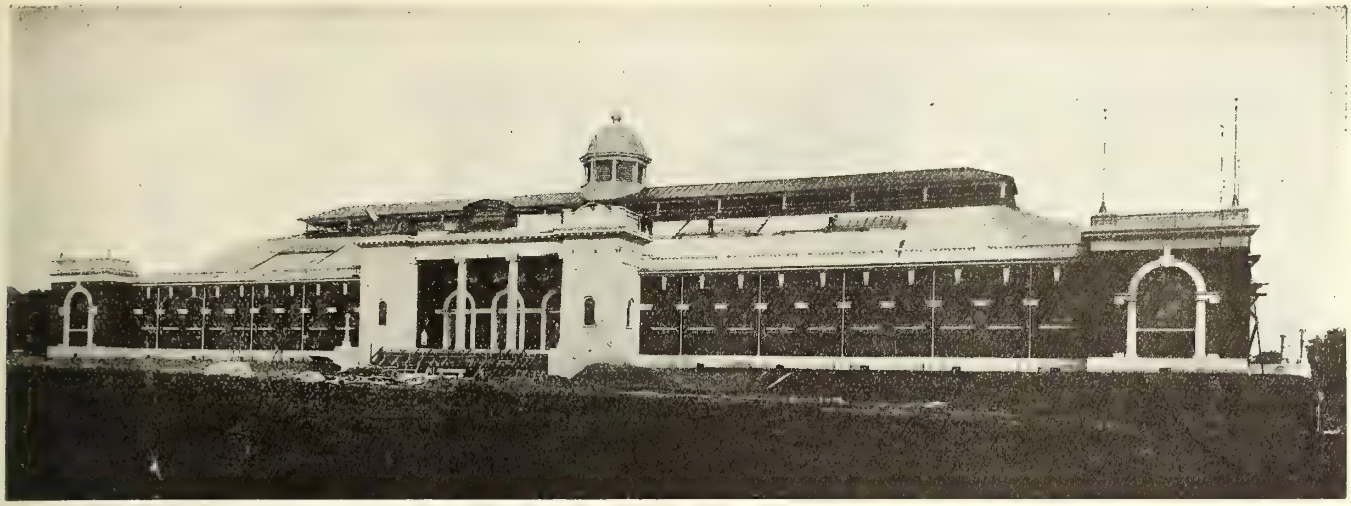
  - Lecky & Collis.
  - Marsh & Henthorn.
  - Mussens Limited.
  - Royce Limited
  - Sturtevant Co. of Can. Ltd. B. F.
- Hoisting Engines
  - Canadian Allis-Chalmers, Limited.
  - Canadian Fairbanks-Morse Co.
  - Wettlaufer Bros.
- Hydrants
  - Canada Iron Corporation.
  - Gartshore-Thomson Pipe Co.
  - Kerr Engine Co.

(Continued on page 12)



Transportation Building, Canadian National Exposition, Toronto.

BUILT OF

Don Valley Bricks

THE building pictured above is admired by a million people annually and it is constructed of Don Valley Bricks.

This material was selected for its proven ability to withstand the destructing influence of time and erosion.

In every part of Canada may be found buildings of Don Valley Brick and Terra Cotta Fireproofing.

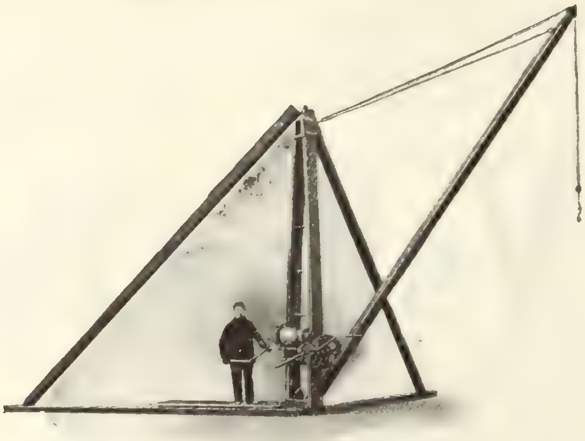
Specify Don Valley

Don Valley Brick Works

Toronto, Ontario

Beath Scotch Derricks

Hand or Power



THE construction of Beath Scotch Derricks embodies several points of merit not found in other makes.

All stress parts are **steel** not cast iron. Bottom Pintle Bearing is of ball and socket type and works in a bath of oil, thus ensuring an easy movement at this joint.

Beath Derricks are provided with self-oiling bearings, ensuring easy operation and reducing wear to a minimum.

We also make Jinniwink Derricks, Stiff Leg Derricks, Guy Derricks, and Steel Derricks for heavy service. Hand or Power operated.

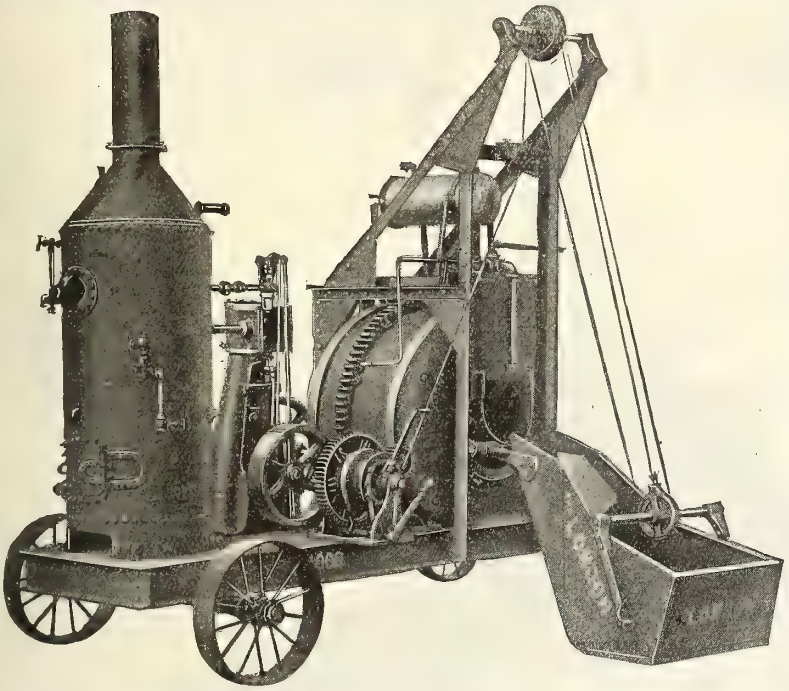
Send us your enquiries for Derricks

W. D. Beath & Son, Limited

ENGINEERS AND MANUFACTURERS

20-30 Cooper Ave., Toronto

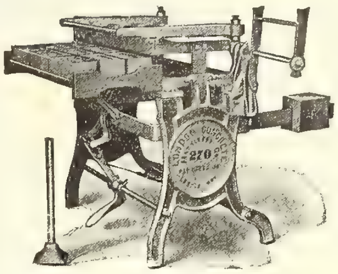
HAVE YOU SEEN OUR 180 PAGE CATALOGUE?



London Standard Drum Batch Mixer

Showing the largest line of Concrete Machinery ever crammed into a Catalogue.

All made in our own Factory and under a system producing an excellence of quality. Our large output right from Factory to the Contractor.



London Cement Brick Machine.

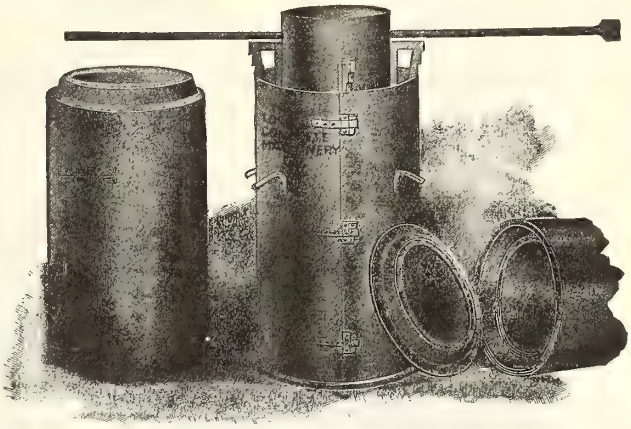
Even such remarkably low prices are preferable to exorbitant prices and small output.

Some people wonder how we can sell high grade machinery at such low prices. **It is quite simple. Our Enormous Sales and Small Profits are sufficient explanation.**

We manufacture over twenty different sizes and styles of **Concrete Mixers, Mortar Mixers, Concrete Block Machines, Cement Brick Machines, Cement Tile Machines, Tile Moulds, Rock Crushers, Screens and Elevators.**

London Cement Block Machine.

- **Gasoline Engines**
- **Pumping Outfits**
- **Steam and Gasoline Hoists**
- **Material Elevators**
- **Sidewalk Forms**
- **Sidewalk Tile Machines**
- **Concrete Carts**
- **Wheel Barrows**



London Sewer Pipe and Tile Moulds.

Sill, Step and Widow-Cap Moulds

A Complete Line of Cement Working Tools.

London Concrete Machinery Co., Limited

Head Office and Factory: Cabell St. and Kitchener Ave., London, Ont.

BRANCHES:

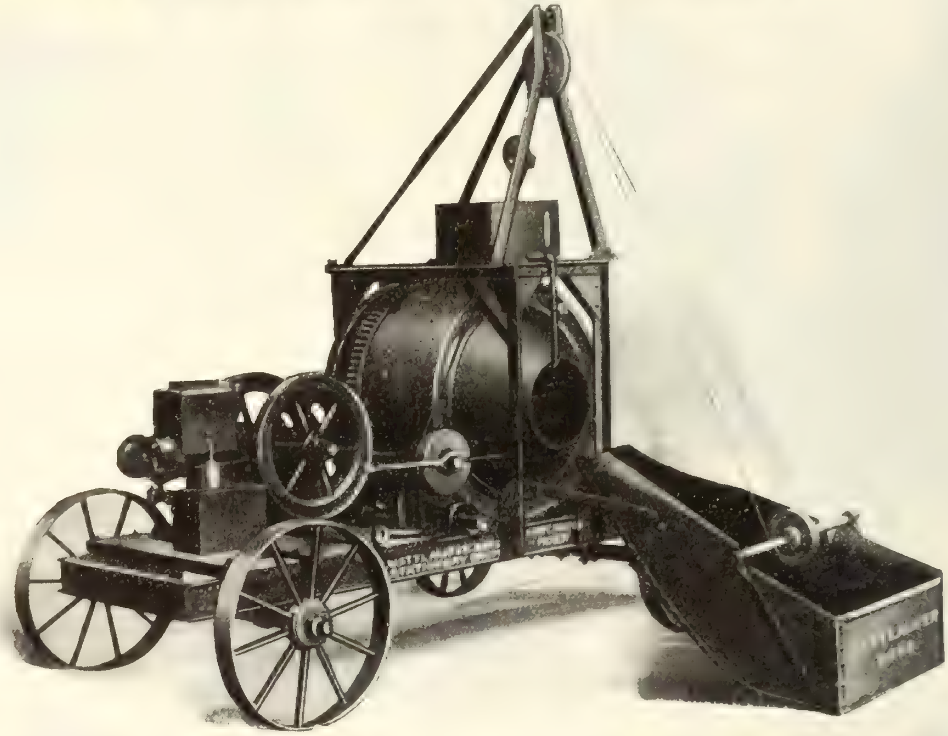
WINNIPEG (445 Main St.) W. H. Rosevear, Mgr. CALGARY (622 9th Ave. W.) P. D. McLaren, Mgr.
TORONTO (60 Richmond St. E.) F. D. Emsley, Mgr.

AGENCIES:

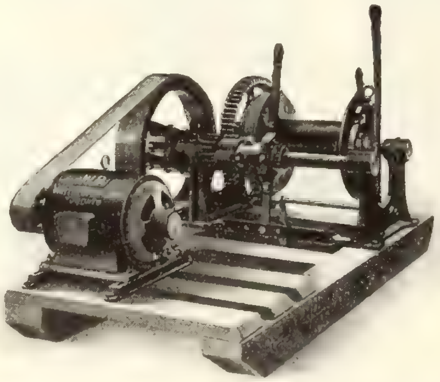
VANCOUVER, B. C. Equipment Co. MOOSE JAW, Sask. Bridge & Iron Co., Ltd. REGINA, H. A. Knight
FORT WILLIAM, Northern Eng. & Supply Co. MONTREAL, Foss & Hill Mach. Co. QUEBEC, A. D. Masson

We are the Largest Manufacturers of Concrete Machinery in Canada.

One of the Newest in the Wettlaufer Line

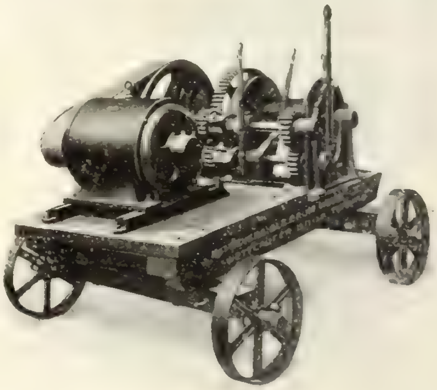


The Wettlaufer Heart Shape Stationary DRUM MIXER with Automatic lift makes it possible for the contractor to increase his capacity without increasing his labor. One demonstration will convince you of its merits.



Single drum motor driven Wettlaufer Hoist

TWO VERY EFFICIENT HOISTS



Reversible single drum motor driven Wettlaufer Hoist on trucks

The Wettlaufer Line of Heartshape Mixers is the Most Complete in Canada

Wettlaufer Bros.

178 Spadina Ave., Toronto, Ont.

Factories: Mitchell, Ont., Buffalo, N. Y., Detroit, Mich.

AGENCIES:

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Crushed Stone

If you want crushed stone in a big hurry come to us and you will get it.

Our bins are always loaded to the top with stone of all grades and shipments can be made the day your order is received.

Quarries located at Dundas and Vinemount.

Portland Cement

Our several cement mills are located at various points that enable us to make prompt shipments with short hauls.

Send us your next order.

Alfred Rogers
Limited
28 King St. West, Toronto

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- **Ice-making Machinery**
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  - Rhodes Curry & Co.
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  - Piggott & Co., Thos.
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  - Walsh Plate & Structural Works
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  - Lecky & Collis.
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  - Sheldons Limited.
  - Canadian Sirocco Co.
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  - Canadian Ingersoll-Rand Co.
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  - Albert Mfg. Company.
  - Britnell & Company.
  - Crown Gypsum Company.
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  - Can. Supply & Contracting Co.
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  - Escher Wyss & Co.
  - Hamilton Mfg. Co., Wm.
  - Hopkins & Co., F. H.
  - Inglis & Co., John.
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  - Canada Wire & Iron Goods Co.
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  - Steel & Radiation Ltd.
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  - Barber Asphalt Paving Co.
  - Asphalt & Supply Co.
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  - Erie Machine Shops.
  - Lecky & Collis.
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  - Western Wheeled Scraper Co.
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  - Can. H. W. Johns-Manville Co.
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  - Noble, Clarence W.
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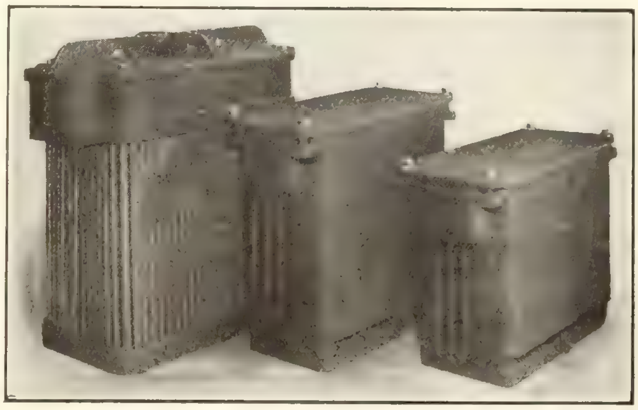
Power Logic

Reduced Loss
Increased Profit } **Ferranti Transformers**



Three Phase Pole or Station Transformers

The Transmission line that is equipped with Ferranti three phase transformers is always a profitable one because of the great reduction in energy-loss made possible by these efficient transformers.

All coils are wound with copper of ample sectional area, thereby reducing copper losses to a minimum.

Three phase transformers are the most economical type to operate and will effect a considerable saving in construction cost.

Write us for particulars

The Ferranti Electrical Co., of Canada, Limited

TORONTO
90 Sherbourne St.

WINNIPEG
56 Albert St.

Office of Dominion Iron & Steel Co., Ltd,
Built of Sydney Pressed Brick

IN this product you get a brick of such superior quality that a saving of one dollar a thousand can be effected in the laying of the bricks as compared with ordinary irregular brick.

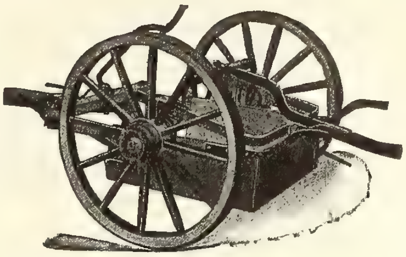
The mortar adheres with great strength to "Sydney" pressed brick and they harden with age.

Prices and Particulars on request.

Sydney Pressed Brick Co.
Limited
Sydney, Nova Scotia

DON'T BE MISLED

THE ORIGINAL AND ONLY THOROUGHLY IMPROVED WHEELED SCRAPERS ARE



Western Wheeled Scrapers

None others are built as strong will give the same satisfactory service or contain the latest improvements.

The Westerns are noted for their capacity, light draft, simplicity and durability. They will shortly pay for themselves, and be paying you a handsome dividend on your investment.

Write for Catalogue.

Western Wheeled Scraper Co.
AURORA, ILLINOIS
Earth and Stone Handling Machinery
Dominion Equipment & Supply Co., Winnipeg-Calgary-Edmonton—Agents for Manitoba, Saskatchewan & Alberta
E. P. Jamison & Company, Ltd., Vancouver
Agents for British Columbia

Hagersville Crushed Stone

The Toughest Stone for Macadam in Ontario

Record of Logan Avenue, Toronto, Macadamized from Queen St. to Gerrard St., in 1902
Length 2,454 Lin. Ft. Width 24 Lin. Ft. 6,550 Sq. Yds.

COST FOR REPAIRS

1903	$ 0.00	1908	$ 93.26
1904	3.30	1909	200.46
1905	9.35	1910	14.07
1906	37.33	1911	2.29
1907	16.11		

Total $376.17 or 5⅔c. per sq. yd. for repairs for nine years, a little over 6-10 of 1c. per sq. yd. per year.

Why Not Use Hagersville Stone and Get These Results?

Hagersville Contracting Co.
Hagersville, Ont. **Limited**

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  - Sand and Supplies Limited.
  - York Sand and Gravel Co.
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  - Shunk Plow Company.
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  - McGregor & McIntyre
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  - Pittsburgh Valve, Foundry & Construction Co.
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  - McDougall Caledonian Iron Wks.
- Steel
  - Canada Steel Co., Ltd.
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  - Lecky & Collis.
  - Provincial Steel Co.
- Steel Bars
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  - Steel Co. of Canada.
  - Steel & Radiation, Ltd.
- Stone
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  - Contractors' Supply Company.
  - Corinthian Stone Company.
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  - Queenstown Quarry Co.
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  - Sackville Freestone Company.
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  - Dake Engine Company.
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  - American Water Softener Co.
- Water Turbines
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  - Boving Company of Canada.
  - Escher Wyss & Co.
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- Wires and Cables
  - Canada Wire & Cable Co.
  - Imperial Wire & Cable Co.
  - Standard Underground Cable Co. of Canada, Limited.
- Wire Guards and Screens
  - Canada Wire & Iron Goods Co.
  - Greening Wire Co., B.
  - Steel Company of Canada.
- Wire Rope
  - Canada Wire & Cable Co.
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  - Steel Company of Canada.
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  - Lyster Wood Box Turning Enamelling Co.

John T. Hepburn

18 to 60 Van Horne Street, TORONTO, CANADA

We Build All Kinds of Cranes for

Hand Power, Electric Power, Steam Power

Brickmaking Machinery

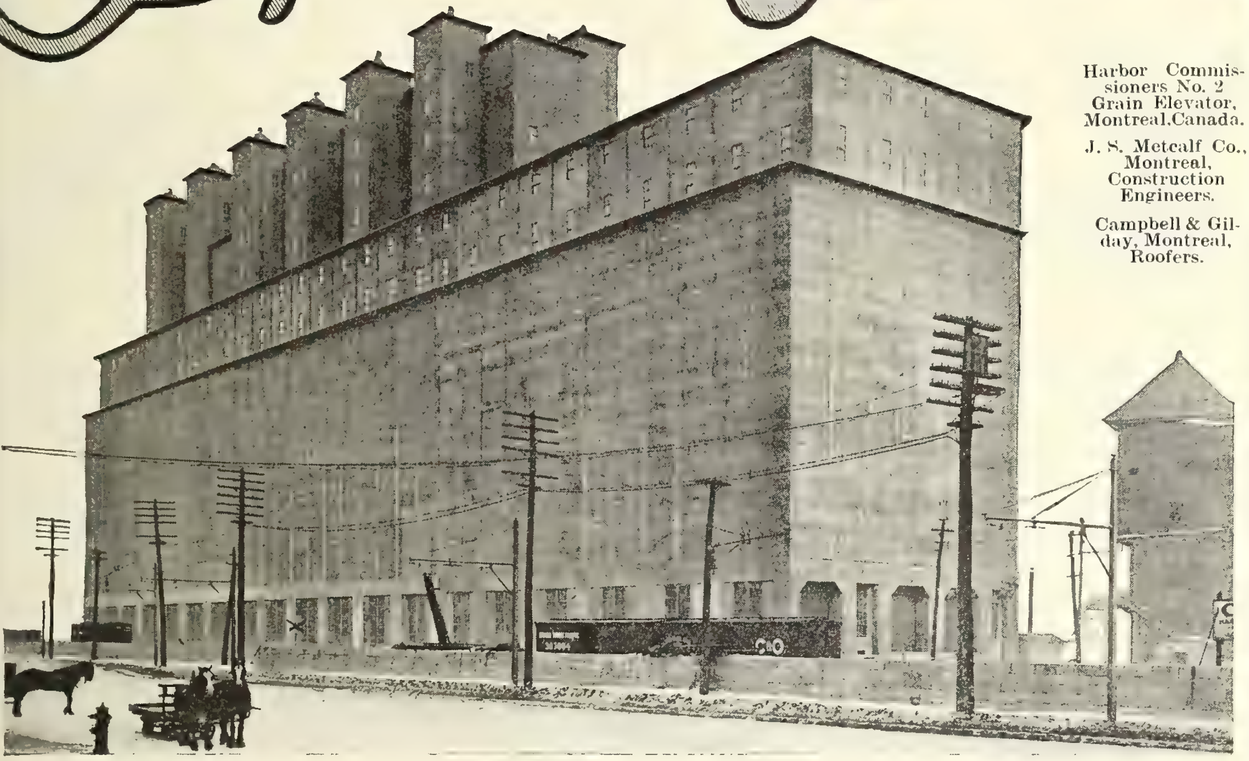
Complete Outfits for Brickmakers

Repairs

Hepburn Scotch Derricks

All Standard Sizes in Stock from 1 2 Ton Upwards

Barrett Specification Roofs



Harbor Commissioners No. 2
Grain Elevator,
Montreal, Canada.

J. S. Metcalf Co.,
Montreal,
Construction
Engineers.

Campbell & Gilday, Montreal,
Roofers.

On the World's Largest Concrete Grain Elevator

As we have frequently pointed out, most of the large commercial buildings of the day are covered with a Barrett Specification type of roof.

For example, here is the great new grain elevator at Montreal. It is said to be the largest in the world, with a capacity of 2,600,000 bushels. It carries a Barrett Specification Roof 55,000 square feet in area.

The engineers chose this type of roof because it is the lowest-priced and most reliable roofing known.

Barrett Specification Roofs require no repairs or attention of any kind, they invariably last twenty years or more, and are fire-retardant.

Architects, engineers and owners of permanent buildings of all kinds should have a copy of the Barrett Specification on file.

A request will bring it by return mail.

Special Note

We advise incorporating in plans the full wording of The Barrett Specification, in order to avoid any misunderstanding.

If any abbreviated form is desired, however, the following is suggested.

ROOFING — Shall be a Barrett Specification Roof laid as directed in printed Specification, revised August 15th, 1911, using the materials specified and subject to the inspection requirement.

THE PATERSON MANUFACTURING COMPANY, LIMITED

MONTREAL TORONTO WINNIPEG VANCOUVER ST. JOHN, N.B. HALIFAX, N.S. SYDNEY, N.S.

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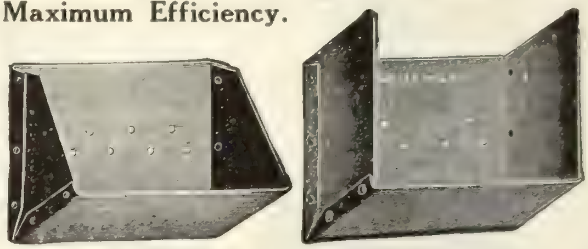

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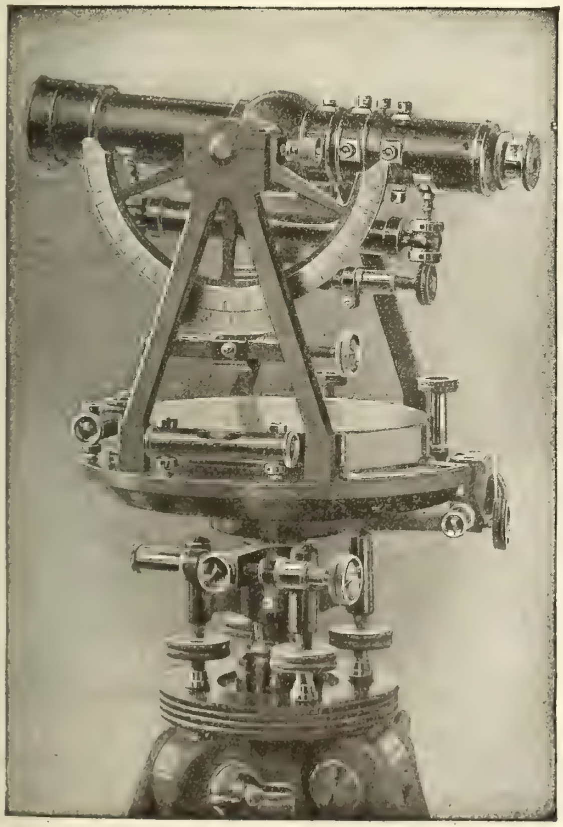

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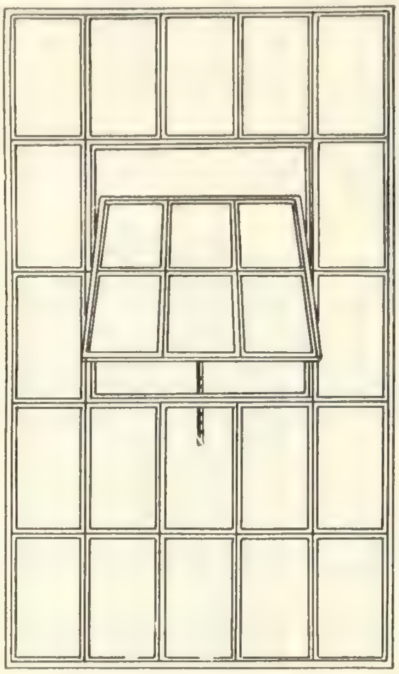

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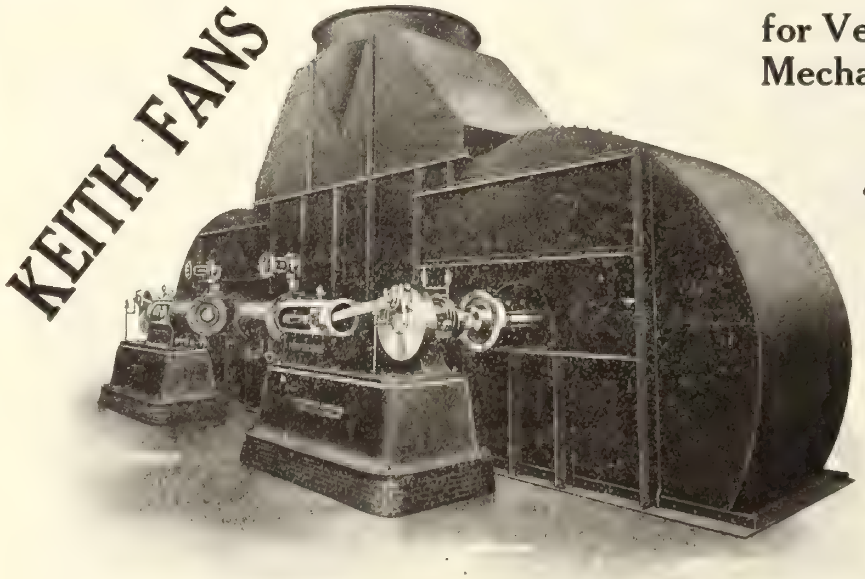

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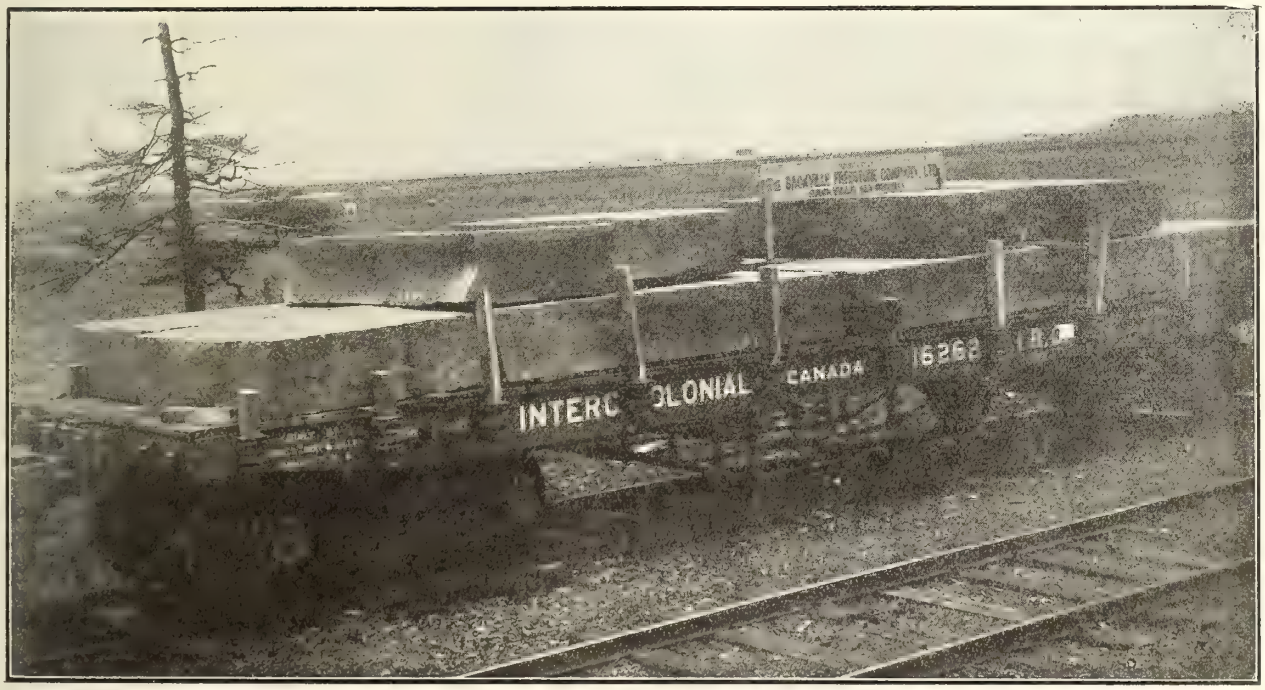

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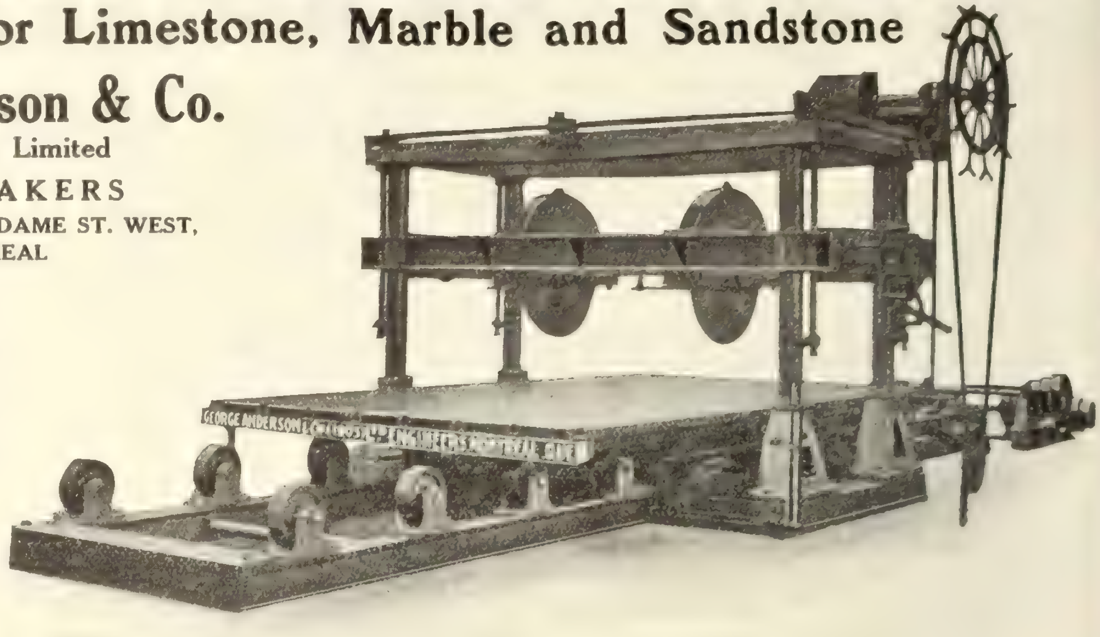

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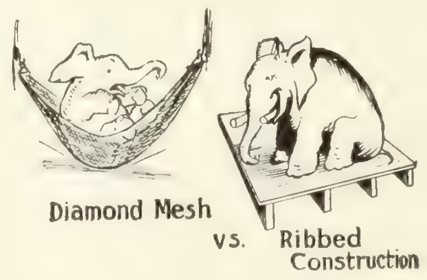

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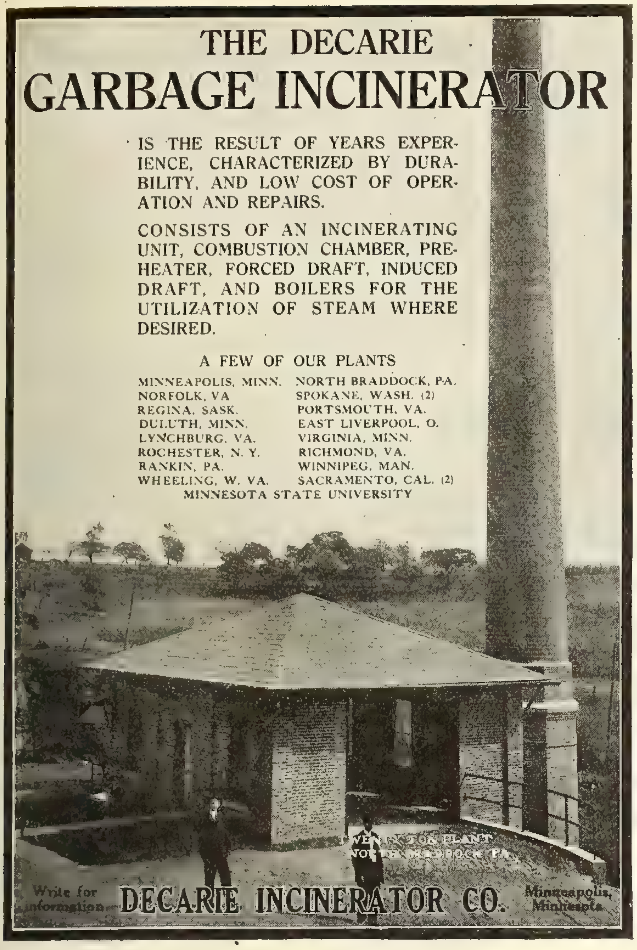

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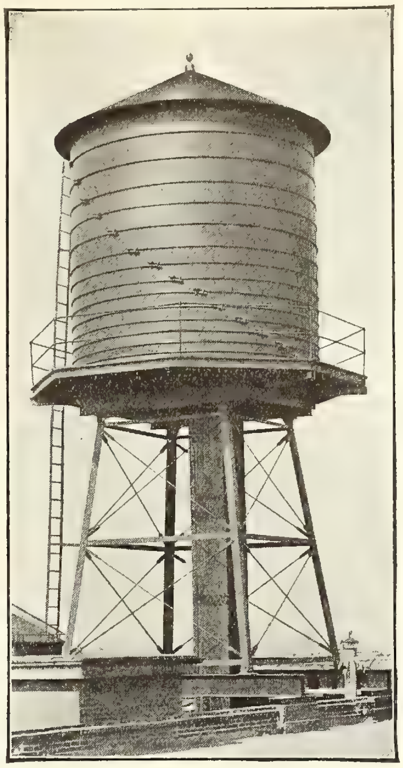

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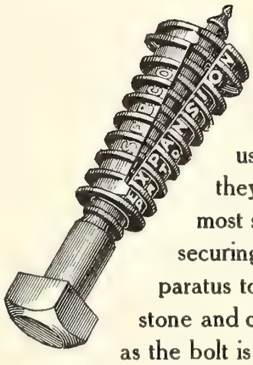

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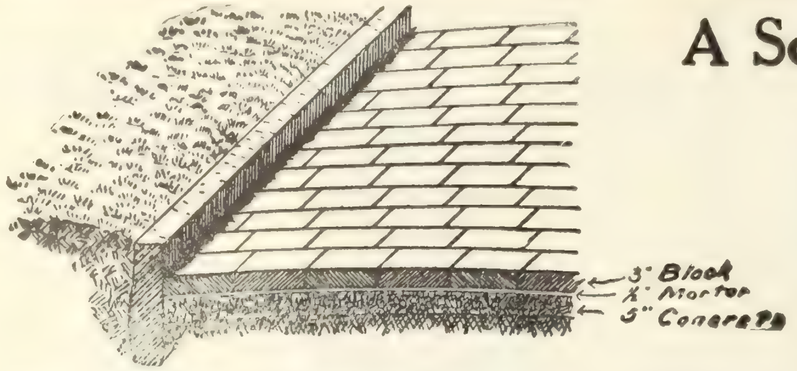

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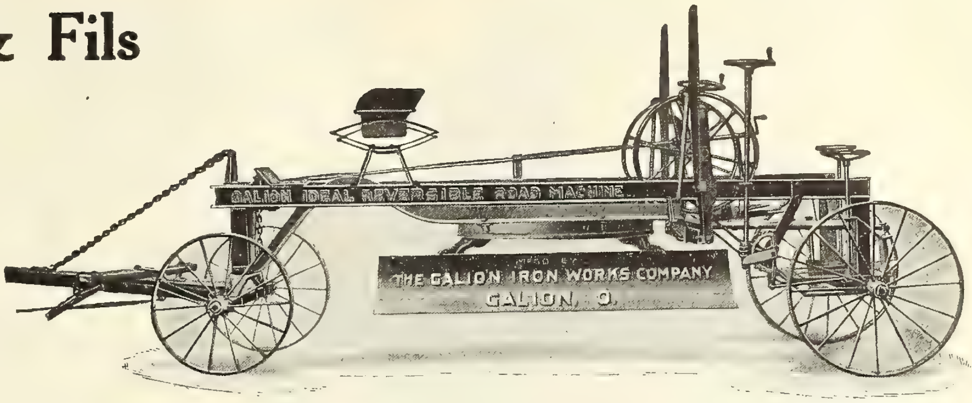
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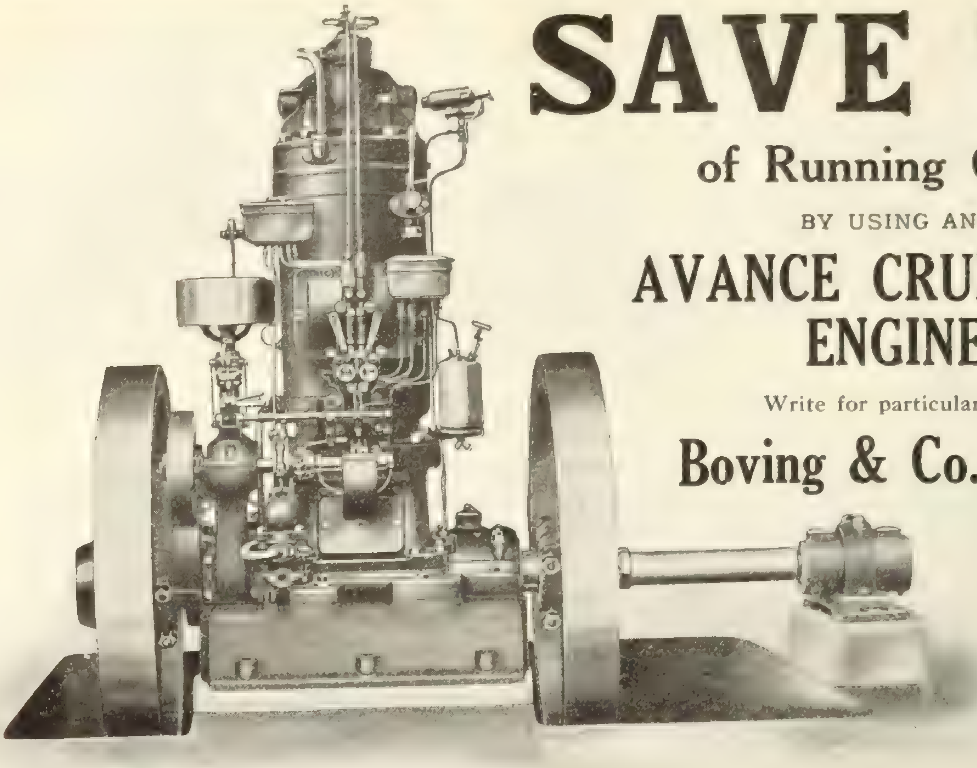

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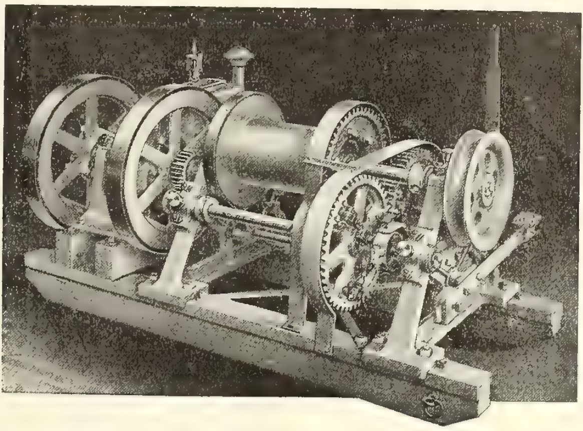

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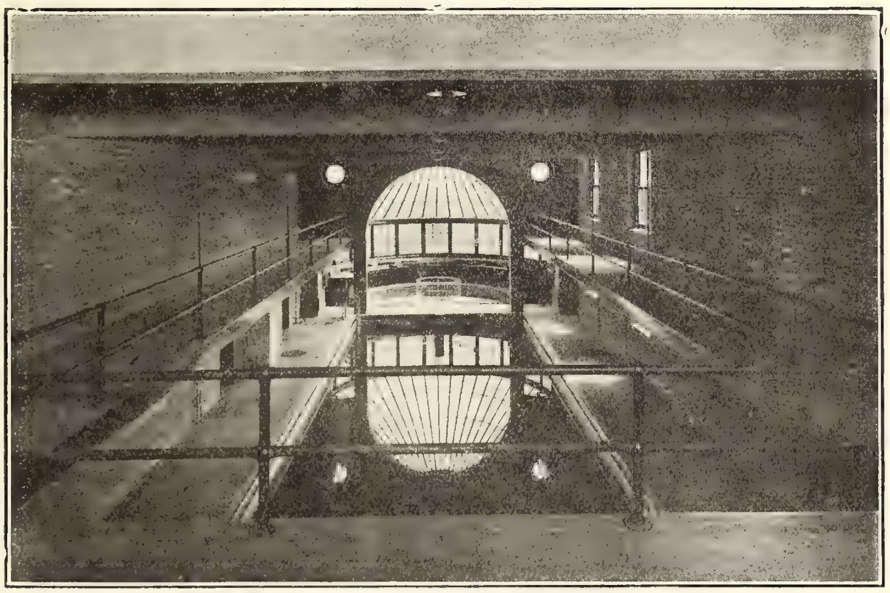

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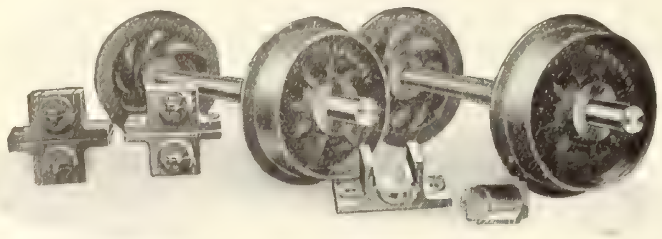

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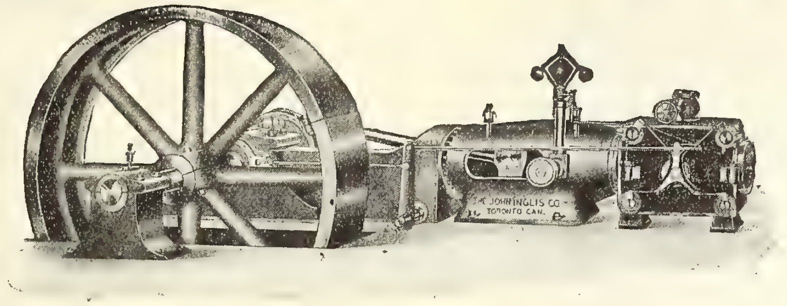

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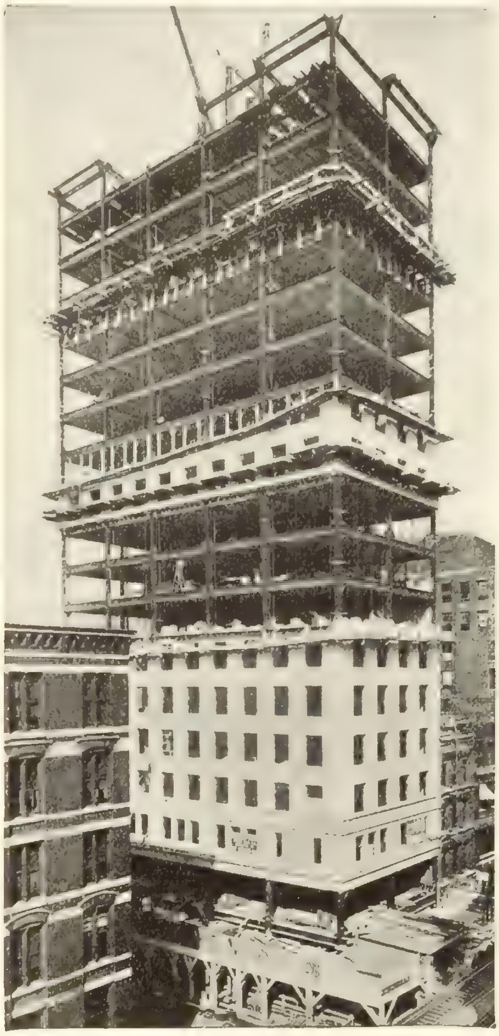

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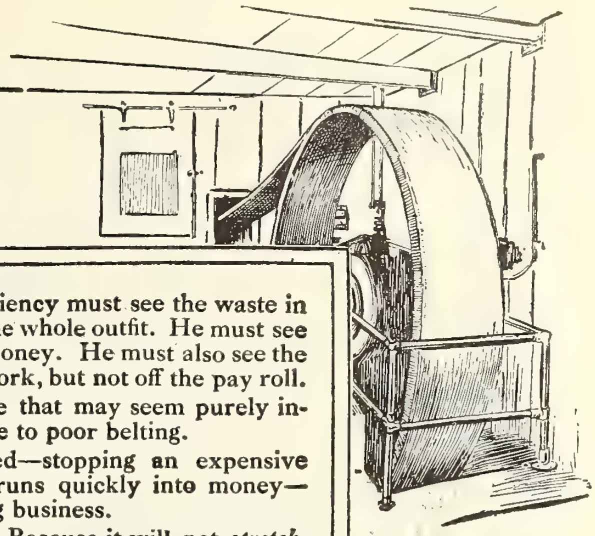

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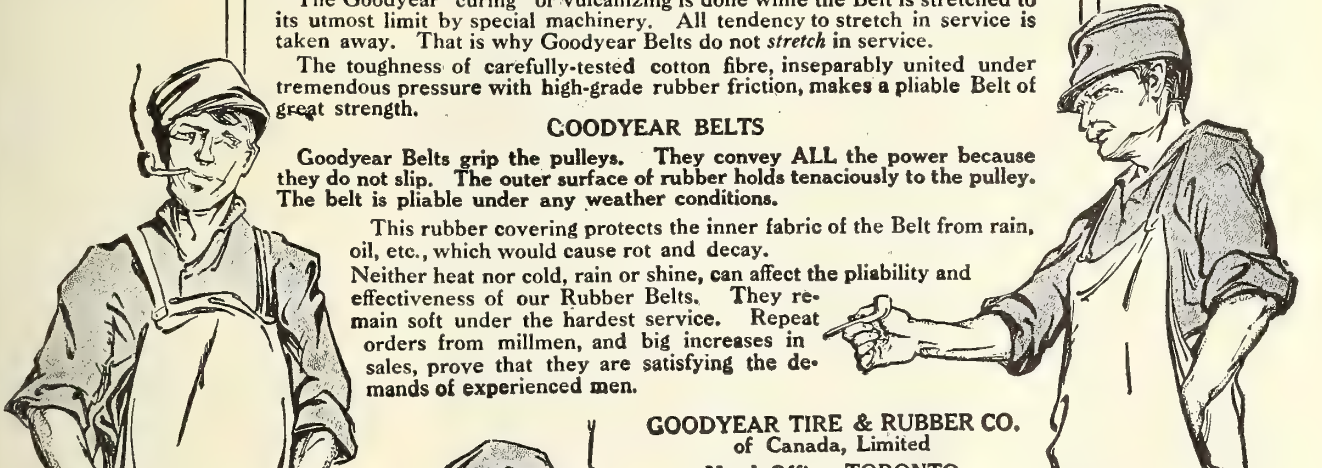

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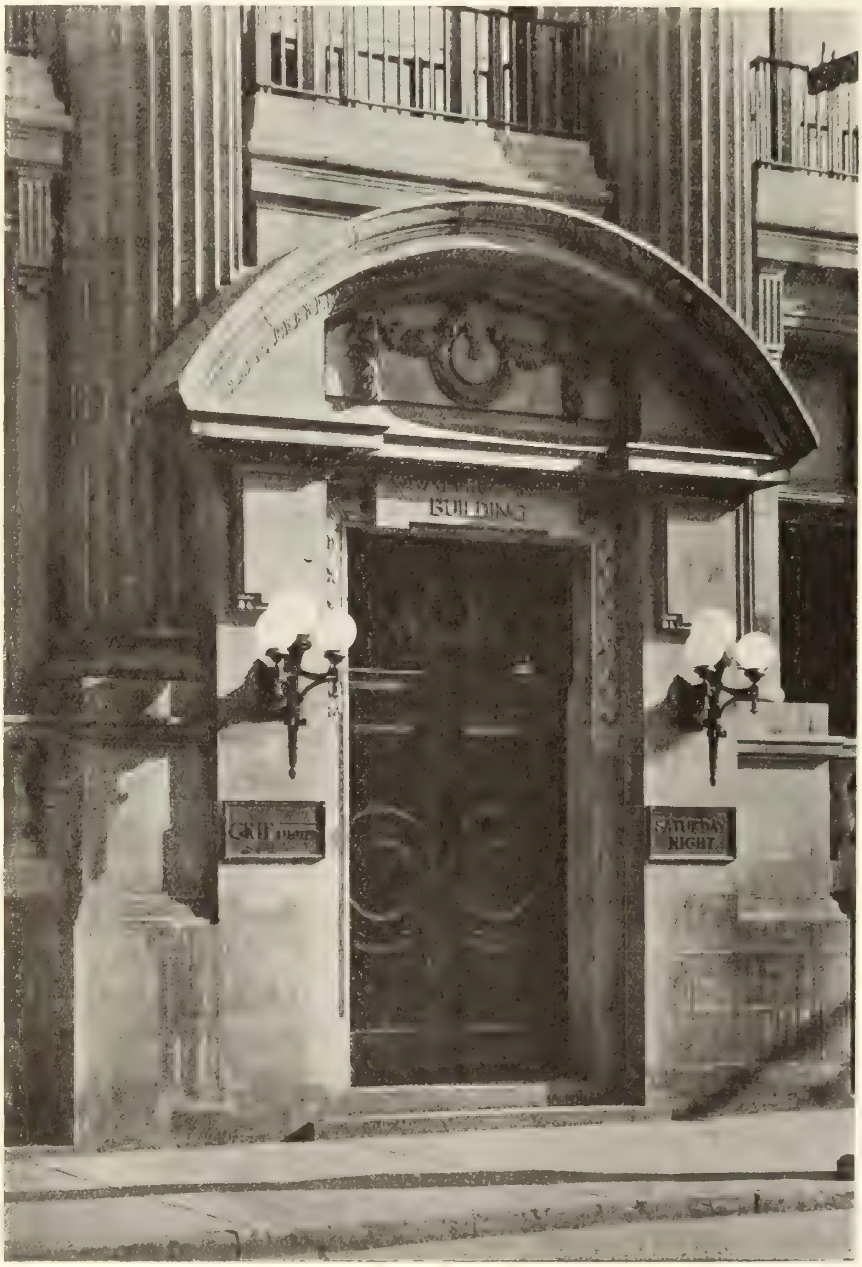

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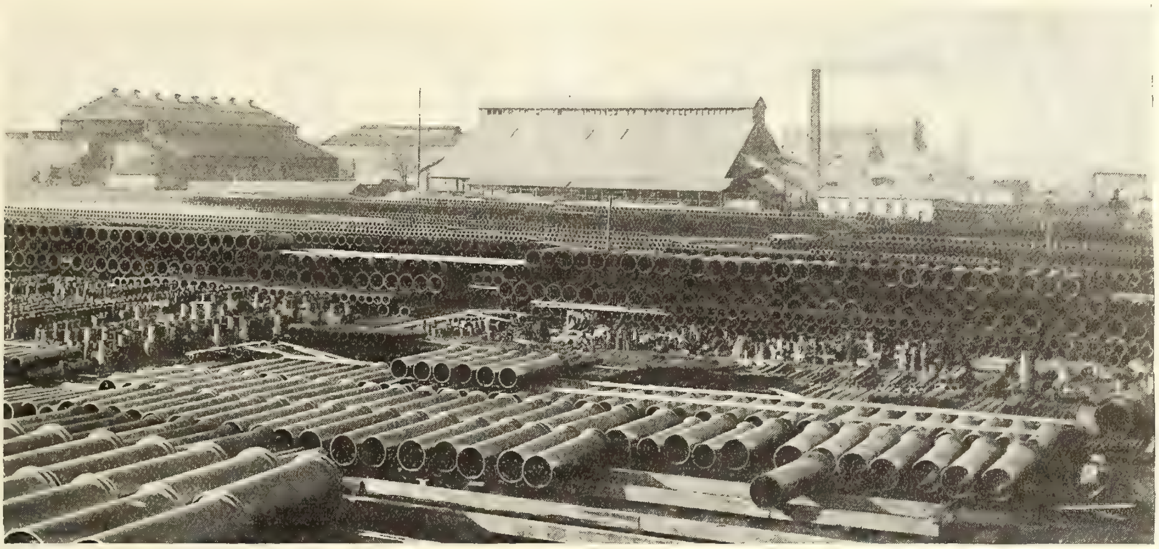

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Heat Treatment of Iron and Steel

AT the recent meeting of the American Society for Testing Materials the committee on the heating treatment of iron and steel recommended the following practice for the treatment of case-hardened carbon-steel objects. In work where hardness of case only is desirable and lack of toughness or even brittleness is not very important, the carburized articles may be quenched from the carburizing temperature. Quenching may be done by emptying the contents of the boxes into cold water or into oil. Under these circumstances both the core and the case are coarsely crystalized. The hardening stresses may be reduced and the danger of distortion and cracking in the quenching bath avoided by removing the articles from the box and allowing them to cool before quenching to a temperature slightly higher than the critical range of the case, namely, 800 to 825 deg. C. Under these circumstances both the core and the case still remain coarsely crystalized.

If it is desirable to refine the case and increase its toughness, the carburized articles should be allowed to cool slightly in the carburizing boxes to 650 deg. C. or below. The articles should then be reheated to a temperature slightly higher than the critical point of the case. A temperature varying between 775 deg. and 825 deg. C., according to the carbon content of the metal and the thickness of the case will be suitable. Greater toughness but less hardness may be obtained by quenching in oil. The object should be removed from the quenching bath before the temperature has fallen below 100 deg. C. This treatment is recommended particularly where the carburizing temperature has not exceeded 900 deg. C. and refines the case but not the core.

In order to refine both the core and the case and to increase their toughness the articles should be allowed to cool slightly from the carburizing temperature to 650 deg. C. or lower. They should then be reheated to a temperature exceeding the critical point of a core which varies from 900 to 950 deg. C.

This temperature is followed by a quenching in water or oil. Before the objects have cooled below 100 deg. C. they should be again reheated to a temperature a little higher than the lower critical point of the case and again quenched in water or oil.

In order to reduce the hardening stresses created by quenching, the objects, as a final treatment, may be tempered by reheating them to a temperature not exceeding 200 deg. C.

Greater Safety for the Worker

THERE is a well-marked movement embracing the continents of North America and Europe and organized for the purpose of providing adequate protection for factory workers. The movement is both philanthropic and economic. No one will question that the spirit of benevolence lies at its very foundation, but that it is business-like and based on economic principles is not so readily admitted.

In the province of Ontario alone last year the number of accidental deaths among factory workers was 62 and the number of accidents reported was 1,502. According to the insurance tables the loss for each man killed is $7,265 and for each injured man $660. Based upon these tables the loss to Ontario for the past year is approximately one and a-half million dollars. But this is not a fair estimate. Indeed it is impossible to express in figures the extent of the loss occasioned to the family and to the state by the cutting short of a man's possibilities.

From the employer's standpoint the loss is of a fourfold nature. Stoppages, however short, through accident occasion loss and the larger the institution the greater the loss. The withdrawal of trained employee from his labor necessitates the training of a new hand and this again involves loss of time, the expense incurred in training and not infrequently a waste of material. Where a series of machines depend upon the output of one, the employment of an untrained operator may very materially decrease the possible output of the shop and the efficiency of the staff is seriously diminished. Perhaps a more tangible but not more real loss is the sums actually paid in damages by the employer because of injury to the employee.

One of the pioneers of the movement to provide safety for the worker is the United States Steel Corporation. Organizations of this kind are not generally classed among the charitable institutions. In 1906 a committee of safety was organized consisting of the heads of the various departments of the Steel Corporation. They made an investigation into the causes of accidents and methods of prevention. Since that date the firm has spent five million dollars in providing safety for its workers. The number of accidents has been reduced by 43 per cent. per annum and the number of deaths for 1911 was over 27 per cent. lower than for 1910. So soundly economic does the company deem the movement, that on one building alone they have spent $32,500 to provide protection for lamp trimmers and window cleaners, and $750,000 is set apart annually to further investigations and to provide safety devices.

The effectiveness of organized effort depends to a large extent upon the co-operation of the workers with the official staff. Two definite lines of conduct are followed. The first consists in educating the men to habits of care and consideration for their fellow workmen; the second consists in the purchase and installing of safety devices wherever possible. In order to teach the men carefulness and to beget in them a sense of responsibility, signs of warning are displaved conspicuously throughout the shops. Illuminated signs bearing warnings are placed at the gates and entrances. Pay envelopes have printed on them terse admonitions in regard to carelessness and such articles as watch fobs, knives, etc., are occasionally distributed, also bearing warnings. The wording of these is changed frequently so as to keep the workers in a state of expectancy.

So far as the equipment is concerned, when purchasing, machinery with safety devices is always specified and the operators are always encouraged and rewarded for suggestions along this line. Ladders are replaced by steps with hand rails where possible. All walks near or over machinery and in dangerous places are also provided with hand rails. Railway tracks running through the yards are depressed and carried through subways. By these means and numerous other devices the Steel Corporation has very materially reduced the death and accident rate of their shops. Other firms are taking the movement up. Some are working with the Steel Corporation, some are working along lines of their own, others are merely taking the results obtained by those who are actively investigating and adopting them to their own needs. The movement has gone so far that the question of international danger warning signs is being seriously discussed and their adoption is quite probable. The reports of the recent calamity at Binghampton carry with them in a most marked manner, the constant need for adequate safety in every department on the part of the employers and ever present alertness and strict conformity to regulations on the part of the employees.

Prevention of Boiler Scale

OPERATING engineers assert that they have been able to prevent boiler scale by the addition of certain substances to the water. The list of materials used in this connection covers an exceedingly wide range and includes such things as spoiled bacon, cheese, graphite, kerosene, Portland cement, potatoes, sugar, tannin and a host of others. Chemists frequently ridicule the use of these substances on the ground that they can have no chemical action upon scale forming salts. Nevertheless those actually operating the boilers have obtained more or less satisfactory results by their use.

An attempt has been made to explain their efficiency by stating that the tannic acid of these substances forms with the mineral matter held in solution by the water, a very soft salt which remains suspended in the water throughout the process of evaporation. However, one fireman asserted that he found a small piece of plank thrown into the boiler effective. The tannic acid contained in this would be exhausted in a day or less and it looks as if the tannic acid theory were not tenable.

Messrs. Edgar T. Wherry and Geo. S. Chiles, in the Engineering Magazine, advance the theory that the effectiveness of the substances named depends upon the operations of the laws of colloid chemistry. A colloid is a substance which when placed in water seems to dissolve but really remains suspended in the water in a finely divided condition. The theory is advanced that the colloid substances in the water tend to come together in large masses and then to pass into a crystaloid form and by the process of evaporation are deposited in scale form upon the boiler. In order then to prevent this massing of the colloids substances should be used which will retard or prevent that action and that this may be done by the addition of other colloids such as glue, gelatine, tannic acid or by the addition of such salts as sodium phosphate. In this case the chemical reaction forms compounds possessing less tendency to unite. The acceptance of this theory should give scope for investigation and place the prevention of scaling on a scientific basis.

Editorial Comment

THE New York Connecting Railroad is constructing a viaduct, part of which is of earth fill. The fill is retained between longitudinal walls, vertical on the inner face but battered on the outer face. The walls are placed about 60 feet apart and their heights vary from 35 to 60 feet. They are 3 feet 9 inches thick at the top and the footings generally go 4 feet 6 inches below the surface of the ground to a hard stratum of sand and gravel. At intervals of 60 or 70 feet the walls are connected by vertical transverse walls reinforced by rods. This portion of the viaduct is substantially a row of large thin concrete boxes filled with earth upon which the tracks are laid. The fill is to be of selected material and thoroughly compacted in shallow crowned layers. It is believed that the shape and compactness of these layers will reduce or almost eliminate the horizontal thrusts on the side walls, so that the function of the latter will approach that of mere facing.

* * *

THE Kansas City municipal authorities have been experimenting with concrete roads provided with one-half inch transverse expansion joints filled with asphalt and placed at 50-foot intervals. The results have been carefully compared with those streets upon which no expansion joints were provided. The pavement in the latter case appears to be freer from longitudinal cracks and secondary transverse cracks than those furnished with the expansion joints. There appears to have been very little movement at the joints as a result of the extremes in temperature. To those making the observations it seems logical to suppose that expansion strains may be disregarded so far as their effect on the disruption of the work is concerned; that expansion joints do not satisfactorily perform their function and that contraction was the only serious temperature effect to be considered. Specifications were changed and paper transverse joints were placed at distances of 30 feet. In the pavements that have passed through the winter of 1912 no cracks have appeared except over the paper joints and these are not noticeable nor nearly so unsightly as the old form of expansion joints.

It is proposed to build an electrically operated subway connecting the Isle of Wight with the main land. The length of the line will be some four miles, and the route will be in a direct line between Stokes Bay on the mainland and Ryde on the Island, the crossing lying a little to the east of the point where passengers for London disembark from the German steamers. The total estimated cost is $3,750,000.

Important Elements in Town Planning*

Aim in Planning—Various Systems—Points to be Considered—Provision for Streets, Civic Centres and Factories—Building Restrictions

By Christopher J. Yorath, A.M. Inst. C.E. Eng., City Commissioner, Saskatoon

ARISTOTLE is said to have defined a City as, "a place where men live a common life for a noble end," which implies an end or aim.

There can be no question that although the end is not a single one, there has been in the building of every city some object in view, some aim towards which those who have been responsible for its foundation and growth have consciously or unconsciously been aiming.

Unfortunately in the majority of cases the aim has been an unconscious one, with the result, that cities have grown up in a haphazard manner, and many a beautiful spot turned into an ugly accumulation of bricks and mortar.

Great Britain by the passing of the Town Planning Act of 1909 took the first step towards the undoing of mistakes of centuries and hopes by planning the future growth of existing and new cities to avoid the enormous expense occasioned through the lack of planning.

Until recent years it was thought that the checkboard system of planning was all that could be desired but anyone who has studied the subject of town planning will realize at once that it is a failure and has necessitated even in what are known as the New World cities large expenditure to rectify some of its many defects. How can a system be called a plan which does not take into consideration local characteristics such as the undulation of the ground; a winding river; and thickly wooded spots.

If Great Britain realizes the necessity of passing a Town Planning Act, surely such an Act would be of infinitely more use to Canada which at present has only a population of about eight millions or slightly more than that of London while its area is three and one-half million square miles compared with one hundred and twelve thousand square miles comprising Great Britain.

A careful study of what wise town planning, the liberal provision of attractive amenities can do, and has done for some of the cities of Europe will convince the greatest anti-town planner of the wisdom of looking well ahead.

It invariably happens that town planning is not thought of or put into operation until a certain amount of development has taken place. In Great Britain this does not interfere to any great extent with the planning for the future as the undeveloped land is not staked out into lots and held by numerous land holders, but is usually in possession of a few; whereas in Canada, owing to the checkerboard system and the selling of outlying plots far in advance of the time when the land is ripe for development the proper planning of the future is rendered far more difficult, and probably in many cases the difficulties will be so great as to make a scheme impracticable without special legislation.

A city attractive by its beauty, by its artistic symmetry and design and by the convenience which it offers will gain a reputation and an individuality of which not only its council and its landowners, but also its citizens, may be proud.

What then should be the aim of every city? To answer that question we are at once thrown back upon the question of what should be the individuality by which the city should be marked and known. Bacon says in his "Essay of Gardens" "God Almighty first planted a garden. And indeed it is the purest of human pleasures, it is the greatest refreshment to the spirits of men without which buildings and palaces are but gross handiwork." Surely then the aim should be the one implied by the term "Garden City," beautiful, well planted, and finely laid out, known and characterised by the charm which it can offer to those who seek a residence or dwelling removed from the turmoil, stress and discomforts of a manufacturing district.

The various systems of planning which have been adopted in the past are rectangular, radial and circumferential, and curvilineal; but the latest schemes for town planning are generally a combination of all three, which allows for the best fulfilment of town planning ideals.

The problem then for the town planner is to consider his scheme in respect to:—

(a) The configuration and undulations of the site.

(b) Direction of main radial and circumferential avenues and boulevards.

(c) The layout and construction of avenues and boulevards.

(d) Open spaces, parks and recreation grounds.

(e) Tramways.

(f) Civic Centre.

(g) Buildings and the space about them; the limitation of the number of houses per acre, and their height and character.

(h) Restrictions of factories and works to special areas.

Configuration and Undulations of Town Site

The beautiful sites which the Great Architect of the Universe has provided for many of our cities have been wantonly spoiled by the worst form of vandalism and the lack of a proper system of planning instead of providing a setting and vista by which the beauty of monumental and public buildings may be shown.

The first essential preparatory to the drawing up of a town planning scheme is to make a contour map of the site with contours showing the rise or fall of the ground every five to ten feet. In addition the map should show existing trees, places of historic or local interest, railways, existing public and industrial buildings, waterways, etc.

This map will enable the town planner to lay down the main avenues with the easiest possible grades, to preserve places of beauty; to establish the sites of the most important buildings so as to be in commanding positions; to design his storm and sanitary sewers so as to obtain the maximum amount of gravity flow, and to arrange his water supply in the most suitable zones so that the whole system of public utilities can be built up of units which will ultimately become parts of a completed whole.

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*Mr. Yorath has had experience in London, Eng., under the Town Planning Act, 1909 and also in connection with the planning scheme for the Federal Capital, Australia.

Main Radial and Circumferential Avenues and Boulevards

In London and New York, and many other large cities, great inconvenience and expense is occasioned through not having the most direct means of transit between business, factory and residential districts, and proper connections between these centres and the different railway depots. Again, through the lack of circumferential avenues the traffic in the centre of the city becomes greatly congested. It is imperative therefore in the planning of a city to exercise the greatest care and judgment in fixing the position and direction of main avenues. If possible they should radiate from the centre towards the principal outlying districts north, south, east and west of the city, and be connected and linked up with inner and outer circumferential avenues. By this means traffic desirous of crossing from one side of the city to the other can avoid the centre and more heavily trafficked streets, and in so doing prevent the congestion which so often occurs in the centre of old cities.

London is at present contemplating the construction of circumferential avenues in order to relieve the congestion which occurs in the centre.

In Vienna the Girdle Linie or Outer Boulevard is about eight miles in length; the total width between buildings is 248 feet. A separate strip of the road is set apart for the tramways and fast traffic; a continuous recreation ground or playing space is included in the scheme, well planted with trees to provide shade during the hot season.

Another circumferential avenue in Vienna is the Ring Street or Hub 178 feet wide. It has a central carriageway 41½ feet wide which is principally used by fast and through traffic vehicles. On either side are the tramways on the electric conduit system. A riding track and a promenade for foot passengers occupy the spaces between the trees, and slow and stopping vehicles find accommodation on the two outer roads.

These circumferential routes which connect up the various parks and open spaces are largely used by residents, motorists and cyclists as circular drives.

Layout and Construction of Avenues and Boulevards

It must be borne in mind that all objects in the street, utilitarian or otherwise are things to be seen, part of an organic whole, each having their respective part and place.

Athens and Rome were each crowded with such objects arranged for the most part in picturesque association. Although it will be impossible for young cities to spend much money, if any, upon beautification, beyond the planting of trees, a town planning scheme should allow for such improvements at some future date at a minimum of expense. Long straight avenues, with buildings of approximately the same height and no object to break the horizon should be avoided. If natural scenic effect cannot be obtained, then provision should be made for some architectural feature to break the skyline. By careful planning it can generally be arranged to place a church, a public building, or artistically designed residence to break the monotony of long streets.

In Germany this branch of town planning is given careful consideration, and long avenues are usually broken by means of "Squares" so that the line of sight will be met by a building, the architecture of which, has been previously approved by the local authority.

In planning out the widths of main roads it is difficult to estimate what the future will demand, but in any case it will be better to err on the wide side rather than the narrow.

The various types of streets usually required in a city are:—

(a) Main business avenues with provision for tramways and boulevards.	width, from 100 feet to 200 feet.
(b) Secondary business avenues without provision for tramways.	width, from 80 feet to 150 feet.
(c) Semi-residential avenues with provision for tramways, side and centre boulevards.	width, from 80 feet to 120 feet.
(d) Semi-residential avenues without provision for tramways, but with side and centre boulevards.	width, from 80 feet to 100 feet.
(e) Residential avenues without provision for tramways, but with side and centre boulevards.	width, from 60 feet to 80 feet.
(f) Secondary residential avenues with carriageways to take local traffic only, with side boulevards and an established building line of 30 feet.	width, from 40 feet to 60 feet.

The main avenues should be laid out with 12-foot sidewalks, slow traffic carriageways next sidewalks, and boulevards on either side of a centre carriageway for fast traffic and tramways. The secondary business avenues should have sidewalks of a minimum width of ten feet with a centre boulevard with wide grass margins, so that the actual paved carriageway can be widened as the business of the city extends.

In main and secondary business thoroughfares provision should be made for laying all sewer, water, electricity and other mains in underground conduits of sufficient size to allow proper inspection at all times. The advantages of this method are:—

(1) The pipes being open to inspection at all times, leaks can be more easily located and repaired.
(2) The traffic is not inconvenienced by frequent openings for repairs.
(3) The enormous annual expense of opening trenches is saved.
(4) The surface of the carriageway, which soon becomes uneven if many trenches are made, retains an even contour.

The residential avenues can be so formed that the sidewalks have a boulevard on either side, which will provide space for pedestrians in the hot weather.

Railways, usually an ugly feature of every city, should be made less objectionable by boulevarding.

Open Spaces, Parks and Recreation Grounds

In locating open spaces and parks, special consideration should be given to the preservation of places of natural beauty, such as woods, waterways, etc.

With the checkerboard system of planning, a large amount of valuable ground is often wasted in the unnecessary provision of paved streets and passages. By carefully planning the main and secondary avenues, through traffic can be avoided and residential districts can be laid out in a far less costly manner, and part of the space occupied by paved streets being utilized for open spaces, tennis courts and children's playgrounds. Where individual gardens are not wanted, part of the land between the houses might be laid out as allotment gardens, or as gravel playgrounds, or as paved playgrounds, to prevent a lot of derelict gardens being attached to the houses.

People's parks are universally provided in Europe within or close to the city's gates, namely a large woodland garden or forest intersected by drives and walks and interspersed with spinnies and glades typical as far as possible of rural country.

It is the duty of every city to provide as early as possible, and before development makes the price of land prohibitive, suitable parks within easy access of the public.

Country life is acknowledged to be more healthful, more restful, more natural and less wearing than that of town, it should therefore be the aim of town planners to introduce into the home life of the worker conditions as far as possible which are common to the country, viz.:—quiet, the absence of distracting sights, sounds and influences and the introduction of works of nature.

It has become a very general rule in making arrangements for the development of land on modern lines in Great Britain to stipulate that one acre in ten shall be set aside as public, or semi-public open spaces, this in addition to limiting the number of houses per acre.

Tramways

The tramway system should follow the main avenues and as far as possible each route should be linked up one with the other to form easy and suitable means of transit for the public to and from every part of the city. It should be arranged so that new lines could be constructed as the development of the town in a particular district required yet be part of what would ultimately become a completed scheme.

The tramway system of Vienna is an admirable one. It has been described as follows:—"The trams circle round the Ringstrasse and the outgoing routes branch off like the spokes of a wheel, it soon becomes an easy matter to know where to leave the hub and take the necessary spoke."

Civic Centre

The creation of a fitting civic centre is one of the most important matters which should be considered. It should be dignified and impressive, whilst at the same time in harmony with the characteristics of the town itself and in keeping with the resources of the public. Its situation should be as near the centre of the city as is possible, so planned that its architectural features and beauty can be seen from many points of vantage.

The buildings usually comprised in such a centre are the town and public halls, offices, session courts, museum, and art galleries, which suitably designed and arranged in relation to each other, can and should form a civic centre worthy of the community.

Buildings, Their Limitation and Character

The regulations with respect to buildings will be one of the most important parts of a town planning scheme and will need very careful thought on the part of local authorities. In order to obviate overcrowding it is essential that a maximum number of houses per acre should be adopted for different grades of property.

In limiting the number per acre it should be sufficient, in the case of land that is not planned out in detail, if it be stated that the rule should be so many houses to the acre, but that the requirements of the local authority would be satisfied if the average number was obtained over a certain area with due safeguards for the space about each house not being too small. There should also be a maximum number of houses stated more than which should not be erected on any one acre. Thus, if the number limited was twelve to the acre, the local authority might be satisfied if on any ten acres no more than one hundred and twenty houses were built.

In residential areas the height should also be limited. Houses should not be built more than three storeys, or more than a maximum height to be defined.

It would seem desirable in planning an area that certain centres should be fixed where shops, schools, churches, institutes, and such like buildings should be grouped together.

The grading of districts and the planning out of the constituent parts which build up a city is an important consideration. The higher buildings should be fronting on the main arteries gradually grading back to the residential property. Stores and offices will, of course, be placed along the main thoroughfares, and workmen's dwellings as close as possible to the factories in which the workpeople are employed.

Restrictions of Factories to Special Areas

It is very desirable in a town plan that the position of these should be fixed and the people should not be allowed to place them where they like. There will nearly always be natural places in a district which will be suitable for factories and workshops. Contiguity to the railway, easy gradients to the same, and the position of the rivers, canals and streams should govern this in most cases.

It is usually accepted as an established fact that factories are unsightly, with untidy and dirty surroundings, but in many places, particularly in Bourneville in England, the headquarters of Cadbury's factory, the reverse is the case. The whole of the surroundings of the factory, and the workers' houses adjoining are laid out on garden city lines and is a model of what can be done to make a factory district more ameniable than is generally the case.

EUROPEAN scientists, taking the sterilizing effect of sunlight as a premises, have experimented and indeed gone beyond the stage of experimentation, upon the sterilizing action of ultra-violet light upon water. In Rouen, France, an installation has been operating for two years and furnishing water sterilized by ultra-violet light. In that time not one single case of typhoid has been reported. During the French-Morroco campaign a similar outfit was supplied to the field hospital and the surgeon reports no typhoid during the two years it was in use. The obstacle in the way of a more general application is the expense of the equipment but with time this will be remedied and we may expect before long to find this method of treatment in quite common use.

Mud removal from Ohio River water by the water purification plant at Louisville, Ky., during 1912 amounted to 2,100 lb. per 1,000,000 gal. of water filtered, or 26 tons daily. In the removal of this mud 49 per cent. was taken out in the sedimentation reservoirs, 45 per cent. in the coagulating basin, and 6 per cent. by the filters. In the removal of bacteria 58 per cent. was obtained through plain sedimentation, 34 per cent. through coagulation, and 7 per cent. by the final process of filtration. The whole system showed a total efficiency in the removal of bacteria of over 99 per cent.

Construction Features in Double-Deck Bascule Bridge[*]

A DOUBLE-DECK bascule bridge over the Chicago River is the principal feature of a project for improving the connection between the business district and the north-side residence district of the city of Chicago, and providing a connecting link in the boulevard system. The only bridge at present is an old and narrow swing bridge at Rush street, and this has to carry the extremely heavy and congested traffic. This traffic includes heavy teaming traffic to the docks and warehouses and an almost incessant stream of automobiles between the city and the residence district.

The present plan of improvement is to widen Michigan avenue north to the river and Pine street south to the river, and to span the river by a bridge of ample capacity for the traffic. To provide this capacity it is proposed to build a double-deck structure. The lower deck (60 ft. wide) will be at the level of the river-front streets and will accommodate the local and teaming traffic. The upper deck (90 ft. wide) will be for the fast vehicles and pleasure driving, and will have inclined viaduct approaches of steel and concrete construction. This improvement is estimated to cost about $2,300,000, exclusive of land to be acquired.

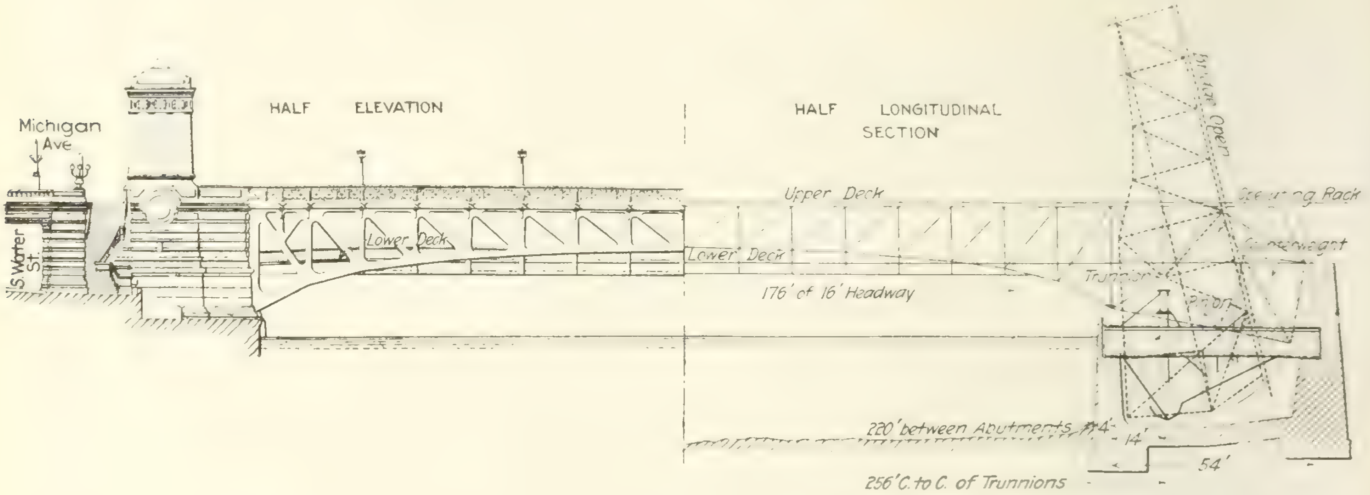

Fig. 1—Double-Deck Bascule Bridge to be built over the Chicago River at Michigan Ave.

The bascule bridge will be of the fixed-trunnion type, as shown in Fig. 1, the trunnions being carried by a steel framing on concrete piers, between which will be the counterweight pits or tail pits. It will be of the double-leaf type, and each leaf will consist of two parallel adjacent portions which will be operated normally as one structure, but which can be operated separately and independently if necessary, as in the event of any accident or failure affecting only one portion. The distance between the trunnions will be 256 ft., and the clear span between abutments will be 220 ft. When the bridge is closed it must give a clear headway of 16½ ft. above the water for a distance of 176 ft., and when open it must give a clear width of opening of 220 ft. to a height of 120 ft. The trunnions will be 15 ft. above datum (or normal water level).

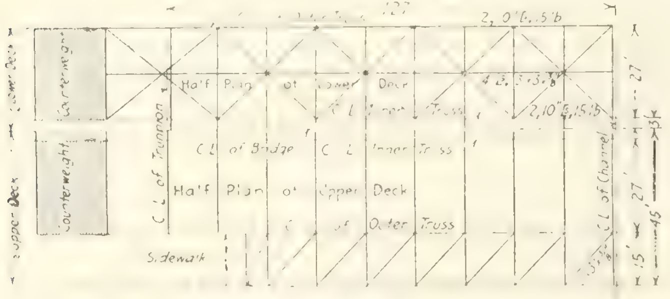

Fig. 2—Arrangement of trusses, floor-beams, and lateral bracing.

Each leaf of the bridge will have four trusses, forming two separate but adjacent and connected structures, as noted above. The two trusses of each part will be 27 ft. c. to c., and the two adjacent inner trusses will be 6 ft. c. to c., giving a total width of 60 ft. between the outer trusses. Each side of the lower deck will carry between the trusses an 18-ft. roadway and a 5-ft. sidewalk. In each roadway will be a single street-car track, having its center line 7 ft. 3 in. from the center of the inner truss. Each side of the upper deck will have a roadway 27 ft. wide between wheel guards and a 15-ft. sidewalk carried outside of the outer truss by cantilever floor beams. Between the two roadways will be a refuge or walk 5½ ft. wide. The clear headway above the lower deck will be 13½ ft. Fig. 2 shows the arrangement of the trusses, and the floor beams and lateral bracing of the two decks.

The roadways of the lower deck will be paved with 4-in. creosoted wood blocks fastened to a layer of 2-in. plank on 4 x 6-in. sub-planking. The latter planking is to be laid upon the roadway stringers, which will be I-beams framed between the floor beams, except that the stringers under the car tracks will be plate girders. The roadways of the upper deck will be paved with asphalt on a buckle-plate floor, the asphalt being reinforced by a continuous sheet of wire netting fastened to the stringer flanges by hook bolts. All sidewalks, and the center walks, will have 2 x 6-in. pine planking on pine stringers. All timber used in the bridge will be creosoted. Fig. 3 shows a cross-section of each deck, with its paving.

The live load for the upper deck is taken as follows:

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[*] Engineering News.

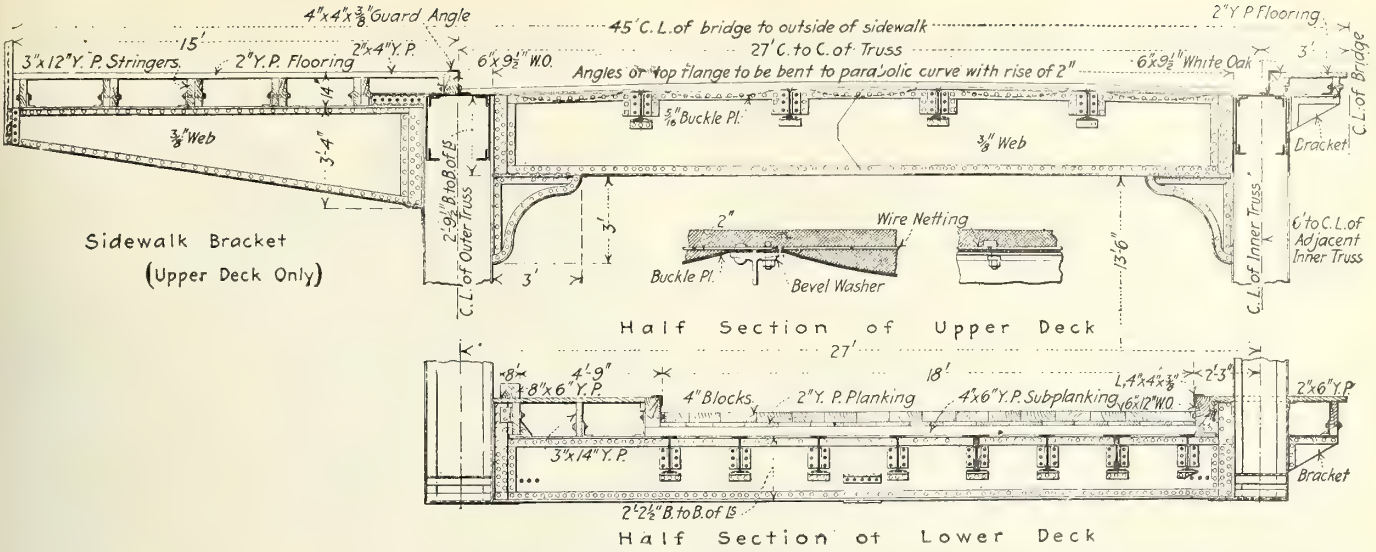


Fig. 3—Floor beams and paving.

(1) two 20-ton vehicles close together on each roadway, each with four wheels, carrying 5 tons load, spaced 5 ft. and 10 ft.; (2) allowing 10 x 20 ft. for each vehicle, the remaining area (including sidewalks) will have a uniformly distributed load of 100 lb. per sq. ft. The live load for the lower deck is taken as follows: (1) on each roadway a continuous line of 50-ton 50-ft. street cars and a 20-ton moving vehicle (as above); (2) a distributed load of 100 lb. per sq. ft. on all the unoccupied area of the roadway and sidewalks. To allow for dynamic effect of live loads, the maximum computed live-load stress is to be increased by an amount determined by the following impact formula, in which I is the increment to be added, S is the computed maximum live-load stress, L is the length (feet) of load on bridge producing maximum stress, and N is 10 per cent. of the total width of roadway and sidewalks loaded to produce maximum stress.

$$I = S \frac{100}{N L + 300}$$

In addition to the above loads, a moving lateral load is assumed of 300 lb. per lin. ft. of each chord or deck. When the bridge is moving, or is open to any extent, the loads causing stress in structural parts of the moving or supporting structure shall consist of the dead weight, with 20 per cent. added for effects of vibration and a wind force of 20 lb. per sq. ft. over the entire exposed area.

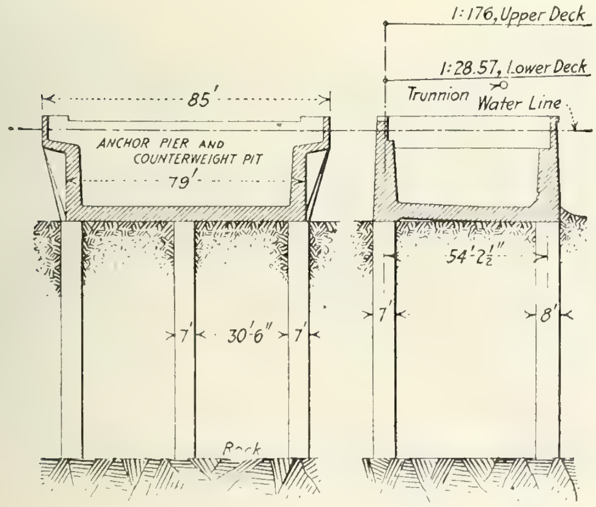


Fig. 4—Box pier on cylinder piers.

On each side of the river, behind the anchor piers, will be a machinery room with four 100 h.p. electric motors so connected that any two can be used to operate the four-truss single-leaf. Gear trains will transmit the power from the motor shaft to main pinions engaging with segmental racks on the two outer trusses. In addition there will be at each side of the river, a 7½ h.p. motor to operate the heel locks supporting the tail ends of the trusses, and on the south leaf of the bridge there will be two 5 h.p. motors to operate the center locks. For each leaf there will be hand and compressed-air brakes.

The substructure on each side will be a box-shaped pier, forming the abutment and tail pit, with the front and back walls each supported by three 8-ft. concrete-cylinder piers extending down to solid rock. This is shown in Fig. 4. At each end of the bridge will be two houses for the use of the bridge tenders, and these will be of ornamental character, harmonizing with the architectural treatment of the approaches. In view of the character and importance of this structure it is intended to give particular attention to the attractive design of the bridge itself and its approaches and surroundings, for which purpose there will be a broad open space or plaza on the upper level over each of the abutment piers.

The Orange Commercial Club, Orange, Texas, will offer one hundred dollars in prizes for the best mile of road using the split log drag. No compensation will be given the farmers for dragging the road other than the advantages of an improved public highway and an opportunity of winning the prize. The first prize will be $50, second $25, third $15 and the fourth $10. It is estimated that a man and team can keep a mile of road in good condition by running a split log drag 30 hours during the year.

The leading lime producers of Virginia secured a temporary injunction against Governor Mann and the prison officials to prevent the State of Virginia from using its convicts to manufacture lime for agricultural purposes. The circuit court of Richmond dissolved the injunction, but the Supreme Court has granted the lime manufacturers an appeal from the decision. The petitioners claim that the state has no right to engage pay taxes and are engaged in a legitimate enterprise.

Grade Separation, North Toronto

IN compliance with the orders of the Dominion Railway Commission the Canadian Pacific and the Canadian Northern roads are pushing to completion a viaduct, which will eliminate all grade crossings over their tracks between the northern and southern parts of the city of Toronto. The importance of the work, which is the joint undertaking of the two companies, but which is being constructed by the C. P. R. engineering staff, can be readily appreciated. The northern part of the city is experiencing a period of expansion. Traffic of all descriptions has greatly increased and is bound to become far heavier as the residential district moves more and more to the north. This construction on the part of the railways will provide for an uninterrupted and perfectly safe flow of traffic north and south.

Both levels in use.

General Description

The work may be fittingly described as a four-track earthwork viaduct, extending from Summerhill avenue on the east to Dufferin street on the west. There is a natural descent from the east and the west towards Yonge street. The Canadian Pacific engineers took advantage of this configuration and merely reversed the inclination from Yonge street to the east and west so that the viaduct terminates on a level with the tracks already in use at Summerhill Avenue and Dufferin street. After passing Dovercourt Road the Canadian Northern line turns off to the northwest. The new construction is pierced north and south by numerous subways, namely at Summerhill Avenue, Yonge Street, Avenue Road, Davenport Road, Spadina Road, Bathurst Street, Howland Avenue, Christie Street, Shaw Street, Ossington Avenue and Dovercourt Road. From Yonge Street west to Bathurst Street tenders for the subways have been let and the contracts are well under way, Messrs. Wells & Gray having the construction of four of them in charge. The contracts for those west of Bathurst are under consideration at the present time.

It was found that the traffic east and west on Cottingham and the traffic north and south on Albany Avenue and Huron Street was not very busy and that these might be easily served by the neighboring subways, so these streets have been closed entirely by order of the Board of Railway Commissioners. Cottingham is now closed and the other two mentioned streets will be closed on completion of the work.

Earth Fill

As we have noted the viaduct is an earth-fill construction, being three miles in length and 68 feet in width and varying up to 14 feet in height. The fill from Summerhill Avenue to Davenport Road was placed on a timber trestle constructed for the purpose. A structure of caps, stringers and ties supported upon piles was erected and from this the fill was deposited from the railway company's work trains. West of Avenue Road a somewhat new method of operation is being employed. The tracks are supported upon a crib work, which is raised along with the filling until the proper level is reached. Supporting piles are then driven in place and the crib work removed. The earth for the filling is obtained nearly altogether from Leaside Junction. The material obtained in the excavation of the various subways is also used in this capacity. Up to the present time over 125,000 cubic yards of filling have been put in place. Having a supply of filling material available with such a short haul has proved most advantageous. Upon the completion of the fill the beams, stringers and ties are reclaimed for other work, but the piles are allowed to remain in place.

Subways

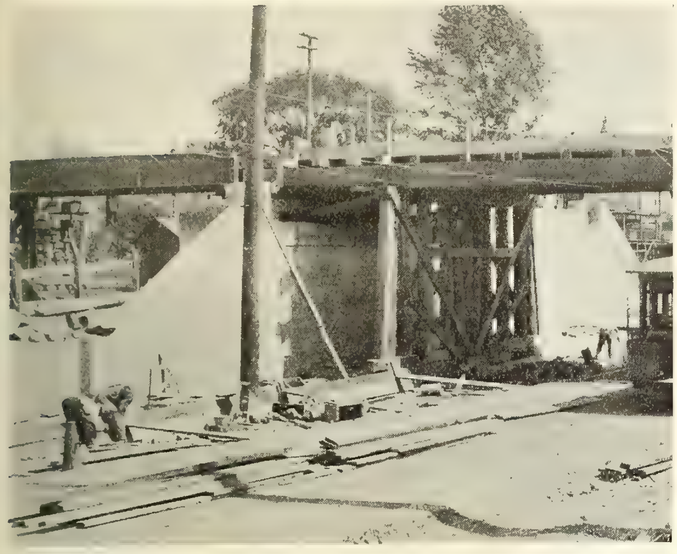
The subways, with the exception of Yonge Street, are of uniform construction. They provide for a 66-foot roadway, with 14-foot headway. This clearance will prove ample for all sorts of traffic. They are provided with end walls and approaches of concrete and a central dividing pier of the same material. The central pier has its advantages. It takes but little space, keeps the traffic in proper place, and may be used to some effect in strengthening the overhead steel work.

At Avenue Road the work is ready for the placing of the overhead steel. This was carried out by Jennings & Ross, Limited, of this city. Spadina and Davenport Roads are now closed and the traffic is maintained by the temporary bridge structure at Huron Street. Steam shovels are at work at Spadina Road and Davenport Road excavating for the subway.

Removal of lower track.

At the junction of Davenport Road and Poplar Plains Road a "T" subway is under construction.

Through this access may be gained to either street. A short distance north of the subway a cross road is being built connecting Bridgman Ave. to Macpherson Ave., which will further facilitate the passage from one road to the other for all traffic north of the subway. Necessary changes to the various public utilities present some obstacles to the accomplishment of the work. In order to procure the proper depression of the roadway, sewers, water mains, Toronto Power Company's conduits, Bell Telephone Company's conduits and gas mains all have to be lowered or cleared away to make room for the foundations. This work is now in progress.



Avenue Road subway under construction.

Yonge Street Subway

The Yonge Street subway involves a number of interesting features. It is to be 86 feet in width, that is, 20 feet wider than those previously described. The overhead clearance is to be 18 feet, which is somewhat out of the ordinary in subway construction. This headway was partly obtained by depressing the street level 9½ feet, and here again the water mains and sewers, conduits, and pipes presented some difficulty.

At this point the viaduct widens out to 120 feet and will bear six tracks with concrete passenger platforms between them. As in the others the walls and piers will be constructed of concrete but will be surfaced to resemble masonry. The roadway will be divided into three parts by two dividing abutments. The central portion will be reserved for the car lines; 20-foot roadways with 10-foot sidewalks will be constructed on each side. By this means car traffic, vehicular traffic and foot passengers will obtain ample accommodation. On the east side the subway will be extended 100 feet beyond the street line. This will provide accommodation for the underground baggage rooms of the North Toronto Union Station, which is to be erected east of Yonge street and south of the tracks.

Mr. B. Ripley, M. Can. Soc. C.E., M. Am. Soc. C.E., is in immediate charge of the work.

Some Observations on the Testing of Sand*

By W. B. Reinke

For any proposed piece of concrete construction, engineers as a rule, and rightly so, are very willing to inspect or have inspected the cement to be used, accepting as a matter of course the necessary expenses involved.

When the subject of sand testing is brought up, however, the reply is generally, "Oh! we don't care about that," or "We will have samples sent to this office and look at them to determine their value." As a rule, they are quite satisfied that they have taken care of everything needed to produce a good concrete when they write strict specifications for the cement. They "pat themselves on the back," look pleased and forget about the sand, overlooking the fact that this material is used as found in its natural state with every chance for wide variation in quality and that it forms from two to four times as much of the concrete as does the cement.

Careful Selection Required

Few specifications contain definite requirements as to the quality of sand, the subject being dismissed with a general clause, providing that it must be clean, sharp and free from loam. As generally interpreted, the word loam includes clay matter and finely divided silica. Experience has shown that for the best results, work sand may be too clean, that it need not necessarily be sharp, and that under some conditions a certain amount of clay or finely divided silica is advantageous. The quality of sand is, as a rule, judged by the eye and touch. No attention is paid as to what the mineral constituents composing it may be; what granulometric analysis it may have; whether it may or may not contain minerals in a combined or free state, which will make it harmful to the concrete; whether it is so finely divided as, through the formation of colloids or otherwise, to retard or inhibit hardening of the concrete; or whether it may contain soluble alkalies, which may hasten the set of the cement to such an extent that the initial set is broken while it is still in the mixer and the whole mass becomes for a period, so far as setting is concerned, so much inert or at best feebly cementitious material.

Necessity for Testing

For the last two years the company with which the writer is associated has investigated the reason for failure to harden properly of a number of pieces of concrete masonry. In some cases where the forms had been removed the concrete was showing signs of yielding to stress of its own weight, raising a question as to its ultimate stability. In others the hardening was being retarded, thus delaying the removal of forms.

From knowledge gained in these investigations, as well as results of many tests of sands carried on in our laboratory, certain salient features and characteristics of sands in general have been brought so forcibly to our notice as to make it seem imperative to pay quite as much attention, if not more, to the inspection of sand entering into any construction, as is paid to the inspection of cement.

It, therefore seems advisable that a committee of this Society be appointed to prepare definite specifications for sand and uniform methods for testing it.

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* Paper before the American Society for Testing Materials.

While the testing of sand is becoming more general, the work is being done under more or less tentative specifications prepared by individuals; no two laboratories seem to apply the same tests or use identical methods, the tests being carried out differently by each investigator. Most tests are made on samples delivered to the laboratories, no opportunity being allowed for the examination of the deposit or the selection of truly representative samples. The reason for this is chiefly one of dollars and cents, and since the condition obtains, the laboratory must do the best it can with the sample submitted.

Tests

The following are the usual tests to which samples of sand submitted for testing are subjected, but it is rarely that all are employed in any one laboratory:

1. Determination of the percentage of moisture;
2. Determination of the percentage of voids;
3. Granulometric analysis;
4. Determination of the percentage of silt;
5. Chemical analysis to determine silica and content of clay matter;
6. Loss on ignition;
7. Volume of mortar from a given amount of sand and cement;
8. Comparative tension tests of mortars made from work sand and standard Ottawa sand, using identical cement and only sufficient water to produce normal consistency.

At this point it is hardly necessary to call attention to the fact that although tension tests are used for testing sands, this practice would seem to be altogether arbitrary and has grown out of the long-established custom of making tension tests of cement, which, as every one knows, was instituted only on account of convenience of having small portable inexpensive machines, which could be carried from one place to another without much trouble.

We would suggest that all comparative sand tests be made on cubes or cylinders subjected to compression, as concrete itself is rarely subjected to tension. This practice has been adopted in Germany, where tension tests of cement and sand mortars have been largely eliminated.

To the foregoing tests should be added several not usually carried out:

1. Microscopic examinations, which need not necessarily be exhaustive;
2. The effect on strength developed by the use of different cements;
3. Permeability of resulting mortars;
4. Weight per cubic foot as received and dried;
5. Determination of the amount of organic matter contained;
6. Tension or preferably compression tests on wet mortars, having the same consistency as used in the work.

This last test the writer believes to be the most important, and one to which all sands should be subjected. To the best of our knowledge, however, it is not generally used by laboratories other than the one with which the writer is connected.

The general practice in testing sands is to compare work sand with standard Ottawa sand, using the same cement, the briquettes being made from mortars having normal consistency, that is, the consistency of a 1:3 Ottawa sand mortar when made according to the standard methods for testing cement. In the test just referred to the sand is made into a mortar of work consistency, that is, the consistency required in mortar to enable the concrete to be poured.

The practice of making comparative sand tests using wet mixtures was developed in our laboratory some years ago while we were trying to find the reason why a sand known to have caused trouble in a certain piece of concrete work gave, when mixed into mortar of normal consistency, tensile strengths greater than those obtained from the same cement and Ottawa sand.

The method of procedure in our laboratory is as follows: The sand to be tested and Ottawa sand are first made into mortars of normal consistency, using preferably cement from the work. These mortars are then made in briquettes, the whole operation being in accordance with the prescribed methods of this Society for the making of sand briquettes when testing cement. The amount of water necessary to make a mortar of normal consistency having been found, a new batch of sand and cement in the desired proportions is thoroughly mixed dry and placed in a cylinder that can be revolved, together with a number of flint pebbles, so that the proportion of the cement, sand and stone will approximate that desired in the actual work. To this mix is added enough water (generally about 50 per cent more than needed for normal consistency) to make a mortar having work consistency. The cylinder is then closed and revolved for five minutes. The flint pebbles are picked out by hand and the mortar is made into briquettes. This test more closely approximates the conditions found in actual work, and the strengths obtained from briquettes made from such a mortar, though, as a rule, far below those obtained from a mortar of normal consistency, correspond to those that may be reasonably expected from the mortar if the sand and same cement are used in construction.

Amount of Water Used

It is to be noted that in most cases, using the same cement, more water will be needed to bring a natural sand to normal consistency than is necessary with Ottawa sand. This difference in the amount of water required is accounted for by the difference in granulometric grading, the work sand, as a rule, having the greater amount of fine material, and hence more surface to be covered and a larger percentage of voids.

Further, it is to be noted that the strengths obtained from a natural sand when made into a mortar of normal consistency are often equal to or greater than those obtained with the same cement, using Ottawa sand. When the same natural sand and cement are made into a mortar of work consistency, which requires about 1½ times as much water as for normal consistency, the reduction of strength will be more or less marked, depending on the character of the natural sand. The strength of all sand mortars is affected by the amount of water used over that required for normal consistency. The more water used, the greater will be the loss in strength at early periods. The nearer a natural sand approaches the ideal in physical and chemical composition, the less will be the loss in strength for each additional per cent. of water added. The amount of water required to bring a given sand to work consistency forms one of the best measures of the quality of sand.

In mixtures using 50 per cent. more water than required to produce normal consistency, Ottawa sand and good natural sands lose from 25 to 35 per cent. of their strength up to the 28-day period, while a poor sand may lose as much as 70 or 80 per cent. of the strength developed when made into mortars of normal consistency. It has been found by experience that with two sands, other things being equal, the one having the smaller amount of fine material will have the less amount of surface to be covered and when mixed with a given amount of cement will need less water to produce a definite consistency than the one containing a larger proportion of fine material.

Many engineers maintain that in making comparative tests of sand, the same amount of water should be used with each sand, overlooking the fact that in actual work one sand will require more water than another to bring the mortar to the consistency required by the work. We cannot assume that the same percentage of water will give the same consistency with two different sands. If this practice is followed one sand may have too much water and the other too little. In the actual work where the sand is to be used, a concrete of a certain consistency will be made with no regard to how much water is needed to obtain it, and in order that the test give a correct indication of the strength the sand will develop under actual work conditions, the test mortars should be made of a corresponding consistency. As stated before, most natural sands take about 1½ times as much water to produce work consistency as is required for normal consistency. This, however, is not true of Ottawa sand which, while taking less water to produce normal consistency, requires more than 50 per cent. addition to produce a mortar of work consistency.

In general, it may be assumed:

1. That the less water required to produce a mortar of a given consistency, the higher will be the strength developed by the sand.

2. That the coarser the sand, other things being equal, the greater will be the strength developed.

3. That the higher the silica content, other things being equal, the greater will be the strength developed.

4. That where it is necessary to use sands of poor quality, loss in strength at early periods can be largely overcome by using a dry concrete.

5. That the loss of strength is confined chiefly to short periods, being practically overcome with time.

Water in Concrete Mixtures

THE occasional failure of important concrete structures, when subjected to floods or other unexpected conditions, indicates that low cost and profits are given more consideration than strength and durability. Then, again, from the writer's observations of the work of others, he is led to believe that while a careful study has been made of cement, sand, and aggregate, the function, purpose, and effect of water in the mix is little understood.

Cement, sand, and the coarser aggregates are inert solids without cohesive or adhesive power. Water, on the other hand, is a fluid without adhesive or sticking power to join two substances together. But water has a very strong surface tension. This is exhibited in what is known as capillary attraction. It is water that binds the inert materials together. This binding power is greatest when every particle of cement, sand, and aggregate is covered with a continuous film of water. If too little water is present, or if it is not evenly distributed, the water film will be broken. If, on the other hand, the thickness of the film is increased to the filling of the interstices between the aggregate this binding power decreases until it is nothing when the solid particles of the mix become immersed in the water.

In addition to being a binder of the solid elements of the mix, the water acts as a lubricant, allowing the solid particles to slip on one another and assume positions resulting in smaller interstices. This increases the density of the mass, and also the capillary attraction of the water film, provided there is not sufficient water present to destroy this film tension. When the excess of water destroys film tension the solids become separated or "suspended" in the fluid. The finer particles of cement "float" in the water filling the interstices or settle from the mass on agitation, and at the same time the "lubrication" of the larger particles is not increased.

It is the finer particles of the cement that develop the greater strength, but when suspended in the fluid or separated from the mass, the "hands" of these particles are not sufficiently long to bridge the water gap separating them from one another or from the larger solids.

It is far easier to build up the water film by careful addition of water than it is to distribute the water after it has been added. If excess of water is added to one part of the mix, so as to "float" the fine particles of cement, it is a question if the film tension can be restored by mixing this with drier materials. This kind of concrete may appear all right, but one part of the mass will not be sufficiently lubricated so the solids can assume the positions for greatest density, and the other parts will be over wet so that the particles of solids will be separated by excess water, and film tension will be lacking in either case. When water is poured or flows from a pipe or nozzle, this is sure to be the effect. The less nearly the cement fills the interstices of the aggregate the more pronounced the effect will be from improper watering. When the water is in just the right proportion to furnish the lubricating effect and the greatest binding power, these forces tend of themselves to draw the particles together into the dense mass.

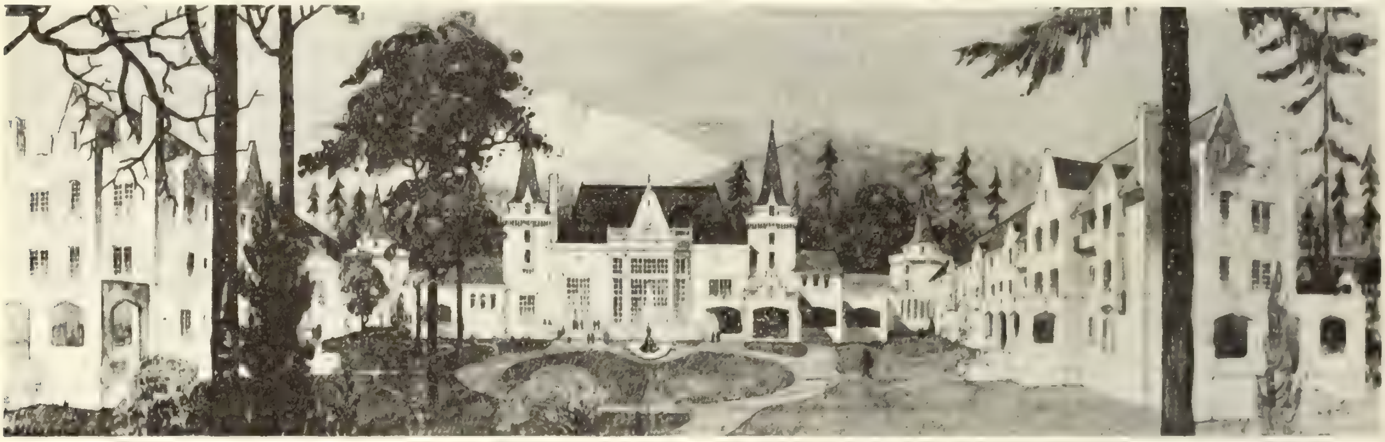
The third property of water in concrete is to furnish the element that causes crystallization of the cement, giving to the concrete its strength. The observation of the writer leads to the belief that the crystal takes the best form when the water is present as just described. But this will not give sufficient water for the complete growth of the crystal. More water must be fed it during the time of curing in order to grow it to maturity.

The writer has used much bank gravel in concrete construction. He has found it economy to screen the fine from the course aggregate. Mix the fine aggregate and the cement, and then mix this with the coarse aggregate, thoroughly drenched. Following thorough mixing, water as needed, is added by sprinkling until tempered to the proper consistency. The sand, fine aggregate, should be just sufficiently damp to cause the cement to adhere. This dampens the cement and establishes capillary attraction. The coarse aggregate has but little capillary attraction and, on mixing, its excess of water is taken up by the superior attraction of the finer materials. In this way the material is all bound together.

With proper watering and curing the same strength is developed with one-half the cement as with improper watering. And when the work is properly managed the cost is very slightly increased. This is true of either hand or power mixing. It is simply a question of whether it is best to add brains or additional cement to the mix.—Municipal Engineering.

Grand Trunk Pacific Hotel Development in the West

IN conjunction with the construction of its lines through the Rockies the Grand Trunk Pacific Railway Company has planned a system of hotels and hydropathic establishments to accommodate the extensive traffic which they expect to handle between Europe and the Orient. On the eastern side the first hotel provided is the Chateau Miette at Jasper Creek, then at Mount Robson a larger establishment is contemplated, and finally, a handsome ten-storey hotel is planned at Prince Rupert, the terminal hotel of the system and designed to accommodate over one thousand guests. The accommodation provided by these hotels should induce many tourists to visit the western mountains of Canada, whose scenery surpasses even that of the Alps.



Grand Trunk Pacific Chateau Mount Robson.

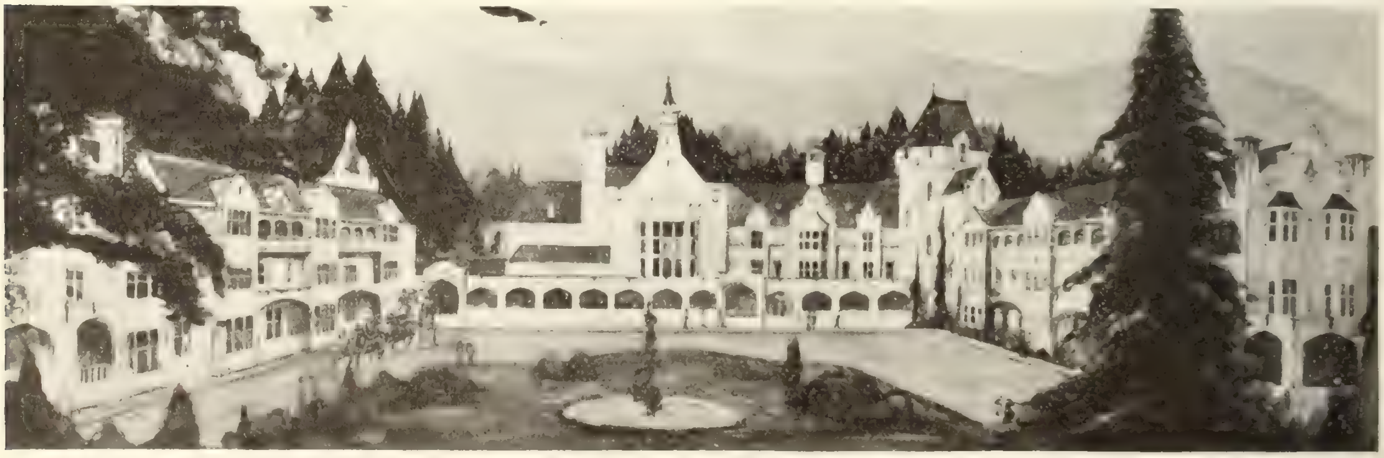
Chateau Miette

The Chateau Miette is designed on the lines of a hydropathic establishment to accommodate family parties. The building is a three-storey structure planned somewhat in the form of the letter "X," having all the common rooms at the intersection of the wings. This arrangement was decided upon in order to permit the guests to obtain the finest views with the least obstruction from other parts of the building.

In style the building is a modern adaptation of the old French chateau, with its high pitched roofs and numerous gables and harmonizing with the ruggedness of the surrounding country. Provision is made for tastefully laid out grounds, with walks, drives, tennis courts, statuary, etc. The Chateau Miette will provide accommodation for about 250 guests. The extensive dining hall, which is 40 by 80 feet, is to be lighted by three large bay windows. The lounging room will be 60 by 35 feet. The plans call for reading, recreation, writing, drawing and billiard rooms.

Chateau Mount Robson

The Chateau Mount Robson is to be more imposing and is designed to accommodate at least 500 guests. The portion to be built at the present time will contain about 150 bedrooms. The dining hall is to be 65 by 104 feet with a fine colonnade and six bay windows lighting the hall on both sides and forming alcoves for private parties. The lounging room is to be a very fine apartment, 112 by 64 feet, overlooking the tennis lawns and grounds. The drawing rooms, parlors, writing rooms and verandas are all designed on a commodious scale and command a fine outlook over the surrounding country.

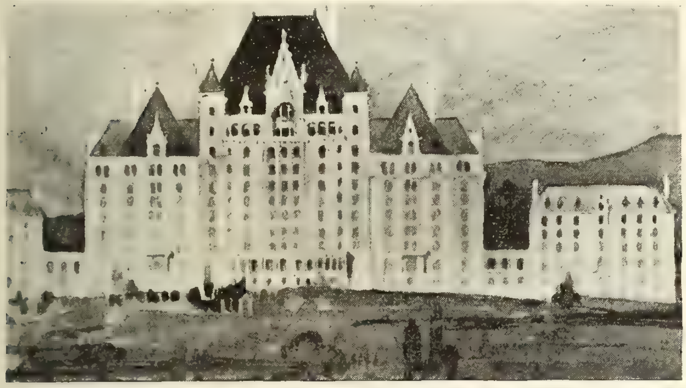


Grand Trunk Pacific Chateau Miette.

The general style of architecture is similar to that of the Chateau Miette. The bedroom wings are three storeys high while the main entrance hall, lounging rooms, etc., are one storey high. The building is to be built of brick finished rough cast and to have terra cotta trimmings. The company is sparing no expense to make this spot particularly attractive and comfortable for travellers.

Hotel Prince Rupert

Hotel Prince Rupert is the terminal hotel of the Grand Trunk Pacific Railway on the Pacific coast. It is designed along commercial lines to meet the needs of an ever-increasing travelling public. The central block is a ten-storey modern hotel and further accommodation has been provided for in the future by two annexes, six storeys each, which will be connected by corridors with the central building. When completed the Hotel Prince Rupert will have over 600 rooms. The building will be fireproof throughout and equipped with all modern conveniences. All exterior work of the lower storeys will be in terra cotta, the upper storeys will be of facing brick. The plans provide for a lounging room 58 by 62 feet, a palm room 104 by 42 feet, a dining room 104 by 52 feet, and a lobby 52 by 62 feet. In addition there will be numerous drawing rooms, parlors, etc. The hotel is to face the water front and will possess extensive grounds. The estimated cost is one million dollars.



G.T.P. Hotel Prince Rupert.

The plans for these extensive buildings were prepared by Mr. R. M. Rattenbury, architect for the Grand Trunk Pacific Railway, to whom we are indebted for the accompanying illustrations and the information.

The Use of Hollow Brick or Tile

By S. H. Penlington, A.R.I.B.A.

Of all modern building materials the one having probably the greatest diversity of purpose is the terra cotta hollow tile. It possesses several qualities which are causing it to come largely into many forms of construction. While light and easily handled and quickly laid, it has a high crushing power, namely two tons per square inch. Furthermore it is a fire and sound proof material of a high order and can be readily made water proof. The terra cotta hollow tile lends itself to convenience in construction operations. Carpenters' fixtures may be nailed to it and the plasterers may apply any stucco work directly to the surface. These characteristics render it an exceedingly valuable material for building purposes.

It will be unnecessary here to give the live loads for various depths and spans of arches as the manufacturers specify these in their own catalogues. The hollow terra cotta tile is ordinarily made in three grades of density, medium, hard and dense. Where wood trimming is to be used "full porous" blocks must be employed to take the nails. The tiles used for arches are always strong enough to develop the full strength of the I-beams.

Advantages

Doubtless the rapidity with which this material may be put in position either in floors, walls or partitions is one of the factors bringing it into common use. In the great modern skyscrapers and other large buildings with numerous floors and thousands of feet of walls and partitions to build, time is of the greatest consideration. Then, too, the cumulative weight of the material resting upon the foundation is an important factor. Exterior walls faced with glazed terra cotta and interior partitions are the lightest that can be built to fulfil first-class fireproofing conditions. The reduction in the weight on the wall beams if an entire terra cotta wall is used, is from 50 to 60 per cent. over a brick design. So that time and lightness favor the selection of this building material where usable. In high buildings the question of wind bracing must always be considered. The deep floor obtained by the use of the hollow terra cotta tile is of great value in this respect. In interior work, partitions, elevator enclosures, etc., the hollow terra cotta tile is particularly effective. In addition to the manner in which it facilitates the carpentry and plastering, and its strength and lightness, it carries single floor loads easily and if required may be reinforced with steel rods to give additional stiffness to the structure.

Roofing

In roofs where the loads are light, especially thick web tile is made to receive the slating nails. This is called a book tile. They are laid with a small T-iron between the rows. Ordinary tile may be used, however, where greater strength is required.

Flooring

In flooring work arch tiles is the usual method of construction, that is, arch tiles of the same depth as the steel beams are used. They are set in cement mortar two inches below the steel to give the necessary fireproofing under the beams. This makes it necessary to have two inches of cinder concrete to bring the floor level with the beams. Another two and a half inches of cinder concrete is necessary to bed the sleeper joists, making a total of four and one-half inches. It can be seen that both of these systems make the floor unnecessarily heavy. It would doubtless be a great improvement to use a tile two inches deeper than the I-beam used. The difference in weight is shown below using a 10-inch I-beam.

Tiles and Beams of the Same Depth

Maple floor	4 lbs. per sq. ft.
4½ in. cinder fill	22 lbs. per sq. ft.
10-in. tile	36 lbs. per sq. ft.
¾-in. plaster	6 lbs. per sq. ft.
Total dead load	68 lbs. per sq. ft.

Tiles Two Inches Deeper Than the Beams

Maple floor	4 lbs. per sq. ft.
2½ in. cinder fill	11 lbs. per sq. ft.
12-in. tile	40 lbs. per sq. ft.
¾-in. plaster	6 lbs. per sq. ft.
Total dead load	61 lbs. per sq ft.

The weight of a reinforced concrete floor of the same strength would be as follows:

Reinforced Concrete Floor

Maple floor	4 lbs. per sq. ft.
2-in. cinder fill	8.5 lbs. per sq. ft.
4-in. concrete slab	48 lbs. per sq. ft.
Steel reinforcement.	.5 lbs. per sq. ft.
Proportion of concrete fireproofing 10-in. I-beam	17 lbs. per sq. ft.
Suspended ceiling	8 lbs. per sq. ft.
Total dead load	86 lbs. per sq. ft.

There is used a segmented arch floor with suspended ceiling. Although this construction may be necessary in some cases it is an easy matter to design a very much lighter one to carry the same load. It would be necessary here to entirely surround the steel beams with cement concrete and also to carry the concrete over the tile of the arch, making a very heavy floor. It should also be noted that the cinder concrete is useless to prevent steel from corrosion. Therefore it is necessary to protect the steel with cement and sand before applying the cinder fill. Frequently it is necessary to leave sufficient room between the steel and floor boards for pipe ducts and thus the depth of the cinder fill is increased.

There are two other systems of hollow tile flooring. They are both designed to give the least dead load and to give a flat ceiling for plaster. The strength of these floors lies in the reinforcement, the tile being used only as fillers in the concrete to lighten the floor. The Johnson system of hollow tile flooring has no "shear" members in the reinforcement. This will reduce the usefulness of the floor by making it applicable only to short spans. The combination system is an ideal floor. It is designed as a reinforced concrete beam with the fillers between. Since the beams are designed with shear members the floor is good for any span.

The weight of the Johnson floor is as follows:

Maple floor	4 lbs. per sq. ft.
2-inch cinder fill	8.5 lbs. per sq. ft.
10-in. tile	36 lbs. per sq. ft.
1½-in. concrete between tiles...	18 lbs. per sq. ft.
2-in. concrete	24 lbs. per sq. ft.
Steel reinforcement	.5 lbs. per sq. ft.
Total dead load	91 lbs.per sq. ft.

The weight of the combination floor is:

Maple floor	4 lbs. per sq. ft.
2-in. cinder fill	8.5 lbs. per sq. ft.
10-in. tile	36 lbs. per sq. ft.
4 by 10 in. concrete beam	40 lbs. per sq. ft.
Steel reinforcement.	.5 lbs. per sq. ft.
¾-in. plaster	6 lbs. per sq. ft.
Total dead load	95 lbs. per sq. ft.

The safe live load for this latter floor from the manufacturer's catalogue is 100 lbs. per square foot on a 12-foot span, a factor of safety of 4.

The wall tiles are made of material similar to that of the floor tiles, the sizes being 12 by 12 in. and of varying thicknesses. The Dennison hollow tile is especially made for walls. This tile gives perfect bedding, short webs, and non-conductivity. The horizontal voids in the tile prevent the air from circulating in the walls from the top to the bottom.

Partition blocks are made 12 by 12 in. and from 2 in. up to 12 in. in thickness. The 2-in. material is used for closets, elevator enclosures, etc. This is also excellent material for room divisions up to 10 feet in height, but the 4-in. tile is generally used. This latter can always be reinforced with steel and concrete filling to sustain any concentrated load in an ordinary floor.

A split tile is made for wall furring. This is especially useful for wet walls.

Plainly then the architect or engineer has here a material that will fill the most stringent requirements. As we have shown, its lightness and the ease with which it may be handled, its strength and the readiness with which it lends itself to varying conditions are most marked. Without doubt as time advances this building material will find fresh applications and come more and more into use.

Ocean Rate Commission

THE government of the Dominion of Canada is taking steps to form in conjunction with representatives from the British Government, an ocean traffic commission. The efficiency of the Dominion Railway Commission has been most marked but their power to control traffic rates is limited by their lack of control over the steamship lines. The ocean rates have been increased 23 per cent. within a short period of time. In some cases these lines are subsidized by the government which has no means of fixing the rates of the lines involved. Such a commission should prove of the utmost importance to Canadian and British shippers.

Attention is drawn by the Engineering Record to the fact that the recent act of congress authorizing the valuation of railways, institutes a work so large that probably about two thousand engineers will be needed to fill positions ranging from those of a minor character in field parties to the responsible work in charge of divisions. All of the positions are to be filled through civil service examinations. Engineers with the necessary training will find it to their advantage to give the forthcoming examinations careful consideration. The salaries paid for this work will be at least as high as those paid by the railroad companies for similar work.

The new bridge now being built across the St. Lawrence river a few miles above Quebec, to replace that which collapsed during construction in 1907, with heavy loss of life, will have a total length of 3,239 ft. between abutments and a clear height of 150 ft. above high tide. Besides two 551-ft. anchor arm spans 310 ft. deep, it will have an 1800-ft. channel span consisting of two 580-ft. cantilever arms connected by suspended trusses 640 ft. long. The estimated cost of the bridge is about $12,000,000, including the contract price of about $8,650,000 for the steel work.

A French method of giving glass, pottery and other siliceous surfaces a metal coating consists in treating the well-cleaned surface with a solution of silver fluoride, exposing to a current of illuminating gas, heating to 50 degrees C., and while at that temperature exposing to a current of carbon sulphide. The result is a deposit of finely-divided silver on the non-conducting surface. This may be burnished for better appearance if desired, or the article may be placed in an electrolytic bath to obtain a coating of other metal.

Permissible Dilution of Sewage*

Hygienic Aspects—Not Used to Advantage—Unimportance of Organic Matter—Degree of Dilution—Summary

By George W. Fuller M. Am. Soc. C.E.

It is not the purpose of the writer to devote any remarks to a review of the literature of this subject, but, on the contrary, to confine himself to the more salient features of the proposition and to point out those matters now receiving most discussion from sanitarians and now needing most careful consideration with respect to judgment and policy.

While he shall not dwell on the literature of this subject he cannot refrain from pointing out that there has really been a great deal of information secured in this country with regard to the dilution method of sewage disposal. This is particularly true with regard to the Chicago drainage canal, the various streams of Massachusetts which have been reported upon by the Massachusetts State Board of Health, the general scheme of sewage disposal for the metropolitan district tributary to New York harbor, and more recently the various investigations which have been undertaken by numerous large cities, such as Philadelphia, Pittsburgh, Cleveland, Milwaukee. In the author's opinion it is very important for engineers and sanitarians having to deal with large sewage disposal projects to keep clearly in mind the experience of others who have had to do with these matters under various conditions in different parts of the country.

At the outset it needs to be explained that the liquid portion of all sewage or water-carried waste must go to the water courses sooner or later. The only exception occurs where the sewage is evaporated. Mention is made of this feature in order to accentuate the thought that the water courses of this country must receive the water-borne wastes in some form or another. The question becomes, therefore, one of the degree to which liquid wastes are improved as to their quality before they are finally disposed of by dilution in some water course.

It is perfectly obvious that as civilization advances, and the population of the country increases, there can be no longer any streams of original pristine purity. That condition absolutely disappears, and such disappearance is one of the penalties of civilization. On the other hand, there are a great many streams in this country—some large ones, as well as numerous small ones—which are over-polluted with water-borne wastes. This is due to an over-stepping of the proper limits of permissible dilution.

Definitions

In order to make a little more plain, perhaps, the viewpoint, on some of these matters, two or three definitions will be considered.

Sewage—The writer defines sewage as the spent water supply of a community together with those trade wastes and street washings which in some instances are removed in underground channels called sewers.

Sewage Disposal—The art of sewage disposal means the economical elimination or prevention of nuisances with respect to these water-borne wastes.

Types of Nuisances—Nuisances due to sewage naturally are grouped into two classes: One refers to conditions that are offensive to the senses of sight and smell. The other refers to the hygienic aspect of the matter and to the transmission of disease germs contained in the sewage to neighboring communities through the water of the stream into which the sewage is discharged. These disease germs refer, of course, to those of the water-borne group, such as typhoid fever, Asiatic cholera, and others of intestinal origin.

The hygienic aspect of sewage disposal is naturally related in many instances to questions of water supply. It is also intimately associated with shellfish problems along the seaboard. Public health officials also have to deal with this aspect of the question with respect to public bath houses and possibilities of transmission of certain diseases by flies from deposits along the shore of some highly-polluted water courses.

Hygienic Aspects of Sewage Disposal

The sterilization of sewage discharged into tidal waters in the general vicinity of shellfish layings has within the last few years proved an economical and, in the hands of careful operators, an efficient means of dealing with one of the important phases of the hygienic side of this question. While there are only a few sewage sterilization plants now in operation, there have been a dozen or more recommended for adoption and it seems unnecessary here to say more on this question in view of the thorough discussion which it has received from Professor Phelps in Water Supply and Irrigation Paper No. 229 of the U. S. Geological Survey. The author is of the opinion that hypochlorite of lime, or some similar sterilizing agent, has a great future before it in the treatment of sewage at places where shellfish are found within certain distances.

Sewage disposal in its relation to public water supplies is, of course, the most important hygienic feature, and it is a question upon which viewpoints vary widely. Some believe that all sewage should be purified so thoroughly that it will practically resemble spring water and so that there will be no need of water purification.

All questions of water supply and sewage disposal should be viewed in the light of all local conditions, having in view that the treatment adopted should give the best returns for the money spent when due regard is given to the benefit derived in the interests of the public health.

The Royal Commission on Sewage Disposal of Great Britain has considered this question at length and its conclusion was as follows:

> "We are satisfied that rivers generally, those traversing agricultural as well as those draining manufacturing or urban areas, are necessarily exposed to other pollutions besides sewage, and it appears to us, therefore, that any authority taking water from such rivers for the purpose of water supply must be held to be aware of the risks to which the water is exposed, and that it should be regarded as part of the duty of that authority,

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*Journal of the Western Society of Engineers.

systematically and thoroughly, to purify the water before distributing it to their customers."

"Apart from the question of drinking waters, we find no evidence to show that the mere presence of organisms of a noxious character in a river constitutes a danger to public health or destroys the amenities of the river. Generally speaking, therefore, we do not consider that in the present state of knowledge, we should be justified in recommending that it should be the duty of a local authority to treat its sewage so that it should be bacteriologically pure."

The conclusion of the commission is a sound one and as a general proposition water purification rather than sewage purification affords a better safeguard of the public health in the present state of the art. It is also to be noted that water purification is not only more reliable, but it is cheaper under most conditions.

In this connection it is to be borne in mind that untreated surface water supplies as a rule do not afford a thoroughly safe drinking water. The reason of this is that there are too many opportunities for pollution from the soil wash and indirect sewerage of small villages and hamlets, and the infection of the water from the casual huntsman, fisherman, or those who for pleasure or business traverse the watershed. There are, of course, exceptions to this rule, but they are growing fewer and fewer. This is well shown in Europe where, since the great cholera epidemic of Hamburg some years ago, it is an unwritten but practically effective law that all surface water supplies shall be filtered.

Many large cities in this country are provided with combined sewers, the entire flow of which at times of storms can scarcely be purified completely. It is true that hypochlorite of lime has proved to be of much help in securing an improved quality of drinking water at many places, but the fact remains that as a general proposition the surface water supplies in this country should be filtered in order to make them thoroughly first-class in point of hygienic character.

While it is believed that the purification of public water supplies in this country is a subject that must stand on it own feet first and foremost, it is undoubtedly true that there are some exceptions to this rule and that sewage purification sometimes should be provided to aid the neighboring water supply. The medical man feels that everything that can be done to destroy disease germs should be done, and is inclined to say purify all sewage and also purify all water. This brings up the question of much practical significance of how a certain expenditure of money can be best applied in the interests of the public health.

Water purification should come first so far as the hygienic side of the matter is concerned, and sewage purification or perhaps sewage treatment by sterilization should come into play in order to make sure that water filters are not overloaded if there is likelihood of inferior quality of filtered water being furnished the consumers.

Double filtration of water supplies and the judicious use of sterilizing arrangements and the advantageous employment of coagulating processes can all be brought to the aid of the water purification plant. Even with all of these precautions as to the water supply, there are times when purification of the sewage of a neighboring community or of the community whose water supply is under consideration, should be carefully provided for. We shall say no more on this question of the hygienic aspects of sewage disposal, as it is hoped that the viewpoint has been made plain that the dilution method of sewage disposal is not barred from this line under ordinary circumstances. The limitations in the dilution method are really to be found in relation to the nuisance question as noted by sense and smell, and this is the question that we shall now proceed to discuss at length.

Nuisances as Related to Sewage Dilution

Sewage dilution is an important, rational, and proper method of disposal of sewage if it is properly applied and is not abused. Disregarding the question of disease germs which we have already considered, the dilution method of disposal is a proper one when by dispersion in water the impurities of the sewage are consumed by bacteria and larger forms of plant and animal life, or otherwise disposed of so that no nuisance results.

The dilution method is by far the most prevalent one now in use in this country. As knowledge becomes more precise as to its advantages and disadvantages, the conclusion becomes more clear that the method has not been applied in a satisfactory way in a large number of instances. On the other hand, there seems to be no good reason why advantage should not be taken of this method within reasonable limits. Between the so-called complete purification of the sewage and the dilution method there are intermediate procedures which allow advantage in point of economy to be taken of the dilution methods, and at the same time the nuisances to sight and smell, which have been so common at various places, may be effectively prevented.

Nuisances attending the sewage dilution method may be due to the following:

1. Floating solids.
2. Settling solids.
3. Non-settling putrescible organic matters.

These three constituents, or groups of constituents, in sewage explain most of the difficulties that are encountered to-day with the sewage dilution method. All can recall instances where orange peel and other household wastes float in bodies of water around sewer outlets. Deposits of "sewage mud" or sludge are seen near the outlets, and the likelihood of their decomposing and producing foul odors particularly at times of low stream flow. There is also the condition where there is inadequate dilution of the sewage as it enters the stream, and where the entire body of water turns black owing to anaerobic decomposition or so-called septic action.

Clean Rivers—There is undoubtedly a well-defined movement on foot to free American rivers of small and moderate size of solid organic matter and filth coming from the flow of sewers. This movement is a proper one and, when combined with adequate purification of water drawn from rivers receiving such sewage, the whole question of sewage disposal by dilution assumes a more reasonable and favorable aspect than hitherto. Furthermore, it does not involve communities in the expense called for by sewage filtration. It modifies, however, the limits that are permissible as to sewage dilution and calls for a recasting of the engineer's views and calculations upon the question. This paper will outline briefly some of the features invold in the permissible limits of sewage dilution in connection with "clean rivers."

Screens—In America there has not been as much progress as in Europe in the use of screens or other arrangements by which floating matters objectionable to the sight are removed from sewage as it enters the stream. In Germany so-called fine screens with an opening of 0.4 in. or less have had many warm advocates. The fine screens have not the standing to-day that they had a few years ago, in the opinion of many engineers, owing to the success attending the sedimentation devices as a cheaper and simpler means of keeping back floating matters and at the same time of removing the coarse heavy solids that subside. In America fine screens have been regarded with questionable favor, owing to the cost of their maintenance. Without discussing the relative merits of different devices, it may be stated that without question floating matters should be removed from sewage before the latter is disposed of by dilution in an adequate body of water.

Sedimentation Tanks—An examination of the Massachusetts State Board of Health reports, and other American data on pollution of streams, quickly shows that the stranding of solids in the vicinity of sewer outlets has in the past proved one of the drawbacks to the satisfactory use of the dilution method. This is particularly true at times of low river stages when banks of "sewage mud" or sewage sludge are exposed to "putrefaction" with attendant bad odors. Some 60 per cent. of the total suspended solids in the ordinary sewage are responsive to subsidence, and unless the sewage is discharged into a river with uniformly high velocities, these solids are bound to strand or settle. The removal of these "settling solids" is an important feature in the establishment of "clean rivers" in this country and, if a few of the larger streams are eliminated the sedimentation of sewage is going to come into general use as a preliminary step in the modern arrangements for sewage dilution.

In earlier days difficulties in disposing of the sewage sludge or solid matters deposited in tanks were the cause of the slow adoption of this important improvement. It is true that chemical precipitation and sludge presses provided a solution of the problem, but at an expense that proved discouraging to many communities, and such that in Europe the cities near the seacoast were led to "barging" the sludge to sea. It is believed that septicization, particularly as embodied in tanks of the two-storey type, will allow this matter in the future to be handled far more satisfactorily than in the past.

Unimportance of Organic Matter in Settled Sewage

If a sewage has been clarified to such an extent that there will be no deposits in the stream bed at or near the sewer outlet, and if the disease germs are killed, there then remains to be considered the sanitary significance of organic matter coming from the settled sewage, and diluted with large volumes of river water. In most cases where the sewage is diluted so that there is formed no offensive odors due to decomposition, and where the sewage has undergone sterilization, it does not seem likely to us that it is necessary in the interests of the public health to go to the expense in most cases of removing the dead organic matter of the settled sewage.

It is intimated by some that the germ theory of disease and the specific infection of water through disease germs does not necessarily tell the whole story as to the hygienic disadvantages of sewage-polluted waterways. On the other hand, the extensive investigations of the United States National Board of Health, as stated in their report for 1882, page 201, indicate that with sewage-polluted waters, it would be necessary to drink half a gallon at once of the waters under test in order to get as much nitrogen and carbon as is contained in a single medicinal dose of strychnine, which is stated to be one of the most energetic of recognized poisons.

A similar view as to the harmlessness of organic matter per se was stated by the late Dr. T. M. Drown in the Special Report of the Massachusetts State Board of Health, 1890, Part I, page 537.

More recently a similar view has been given by Dr. A. C. Houston, now Chief Water Examiner of the Metropolitan Water Board of London, in the Second Report of the Royal Commission on Sewage Disposal, page 27:

> "Organic matter per se in water is seemingly harmless; it is the bacteria likely to be associated with the organic matter that constitute the element of danger. Only bacterioscopic analysis can hope to reveal the kinds of bacteria in an effluent which are of a sort liable to be related to disease. Chemistry is quite powerless in this respect, and, indeed, all chemical standards of potability are apparently based on an assumed relationship, which may or may not exist, between the amount of organic matter and the number and kinds of the associated bacteria. Typhoid fever stools, whether sterilized and innocuous, or unsterilized and highly dangerous, would yield to chemical testing practically the same results as regards the nature and amount of organic matter present."

Furthermore, where there is adequate dilution of settled and sterilized sewage in a river used for a water supply, it is not difficult, as already stated, to effect a substantial removal of organic matters in works well adapted for water purification and involving coagulation, aeration, and sterilization by powerful oxidizing agents.

Degree of Dilution

On the assumption that floating and settling solid matters are removed from the sewage and that disease germs are killed, where necessary, by sterilizing chemicals, the permissible limits for the dilution of sewage may be discussed. The limits should be such that there should be present at all times and in all places sufficient dissolved oxygen to prevent anaerobic or so-called putrefactive decomposition becoming established, and furthermore that there should be a reasonable margin of dissolved oxygen to take care of fish life unless it should prove in some instances that the question of fish life is not of sufficient significance to justify consideration.

On the degree of dilution the first scientific data in this country were obtained in the early days of the consideration of the Chicago drainage canal, and it is from the technical staff of the Chicago Sanitary District that engineers have received their latest information bearing upon this important subject. A few years ago, and in fact until quite recently, all data as to the degree of dilution of sewage referred to crude sewage with its floating and settling solids. The Chicago drainage canal was established on the legal limit of 3 1-3 cu. ft. of water per second to dilute the sewage of each 1,000 persons connected with the sewers. That limit was probably too low for the crude sewage of a city which has such a large proportion of manufacturing wastes in its sewage flow as is the case here in Chicago. For a city without manufacturing wastes it is probably a fair limit, although some data obtained from Massachusetts suggest that it might be wiser to provide a somewhat more liberal volume of water for dilution.

A dilution of 4 cu. ft. per second per 1,000 population is as close a general figure for crude sewage as can now be obtained, although undoubtedly there are various local factors which influence the dilution and may establish a range as wide as from 3 to 7 cu. ft.

As to the degree of dilution necessary for settled sewage, present evidence indicates that at least 2.5 cu. ft. per second per 1,000 population should be provided for residential communities and where the diluting water is well supplied with atmospheric oxygen. For manufacturing cities, where the diluting water is moderately depleted in oxygen during the summer months, this dilution may perhaps have to be doubled, that is, increased to 5 cu. ft. per second per 1,000 population.

There is no precise rule now available, and the above ranges establish as closely as can now be done the permissible limits in the dilution which properly should be applied to settled sewage in preference to raw sewage with floating and settling solids in it.

Dispersion—Mixing—One of the great drawbacks to the dilution method of sewage disposal as applied in earlier years was then the tendency to conduct the sewage only to the margin of the stream and perhaps only to the high-water shore line. This explains the nuisances that prevail in many American cities where the stream flow throughout the entire cross-section of the river is sufficient to provide reasonable results by the dilution method. Enough has been said to indicate that if dilution is to be advantageously used, it should be done under conditions where the sewage is so mixed with the stream flow that the degree of dilution above mentioned will be secured at all points. Naturally, streams with comparatively high velocities allow better results to be obtained than those in which the velocity is reduced or checked entirely at times by mill ponds or other obstructions.

Residual Oxygen

This is a question upon which there are many divergent views. Until it is put on a more satisfactory basis than at present, it is hardly feasible to state the degree of permissible dilution more closely than given above. Colonel Black and Professor Phelps have advocated that a residual margin of 70 per cent. of dissolved oxygen should be provided for the waters of New York bay. A more common opinion places this margin at 50 per cent. Messrs. Wisner and Pearse (of the Sanitary District of Chicago) have put this margin at 2.5 c.c. of dissolved oxygen per liter, which is equal to about 20 per cent. of saturation of oxygen during winter months, and 30 per cent. for the summer temperatures. These gentlemen, however, have reference to fish life. The author's experience is that if stranded solids have been kept out of the stream there will be no occasion for difficulty as to anaerobic or putrefactive decomposition, provided there is some dissolved oxygen present in the stream at all times and at all places. One of the earliest and most important points established at the Lawrence Experiment Station was that a little oxygen, say 1 per cent. to 3 per cent. of that necessary for saturation, would allow oxidation and nitrification to take place as satisfactorily or nearly so, as if the water were saturated with oxygen. There is no reason known to the writer for departing from the teachings of those early experiments at Lawrence, and he believes that estimates of 50 or 70 per cent. for the required residual of dissolved oxygen can be explained only by extraordinary allowances made for the consumption of oxygen by existing sewage sludge, or by more than liberal allowances of oxygen for major fish life. In fact, whatever margin is needed above a slight positive quantity at all times and places in the stream is, in his opinion, solely accountable for by the oxygen necessary for fish.

Fish Requirements—Data are somewhat meagre as to the amount of dissolved atmospheric oxygen which is required in the streams to protect major fish life. The quantity no doubt varies with different species of fish and perhaps other local conditions. In the Lower Elbe near Hamburg it is stated that the margin of dissolved oxygen during the ordinary summer periods falls as low as 20 per cent., and the figure in the Lower Thames is understood to be about 30 per cent. At Hamburg there has been no serious complication as to fish life other than during the summer of 1911, when it is understood that for three or four weeks fish actually migrated from the vicinity of the city. This does not mean that there was any nuisance as to putrefactive odors. In fact, it is stated that none existed. It shows also another point and that is that since the fish returned after a period of three or four weeks, it will be quite debatable whether once or twice in a generation it is necessary to prevent the migration of fish, if by such prevention there will be involved expenditures of vast sums of money for the more complete purification of the sewage.

It was told the author in Berlin last summer that an amount of residual dissolved oxygen equal to 1 c.c. per liter was considered sufficient under ordinary circumstances in the immediate vicinity of a sewer outlet, although 1.5 c.c. were preferable.

Fungus Growth—Professor Thumm, of Berlin, has stated that in waters containing a great abundance of oxygen it is possible that offensive odors might result through the growth of certain fungi, namely, Leptomitus, Sphaerotilus and Cladothrix. The staff of the Royal Prussian Testing Station have observed that these growths are said to be characteristic of streams receiving a lot of industrial wastes, such as come from wood pulp mills. The growths seem to be favored by the presence of much putrescible organic matter, ample dissolved oxygen, and a high velocity of stream flow. These comments are not in harmony with the author's recollections of the life history of these organisms, unless it be that their growth is fostered in certain deposits which are dislodged under certain conditions. The question is an interesting one, and it is the only suggestion that the writer has heard of, which limits the permissible dilution of sewage in other than by the dissolved oxygen, in cases where disease germs are destroyed or may be properly ignored. This is a question which needs further study, and it may be entitled to more consideration that is now realized in America.

Comprehensive Designs

While the writer is a firm believer in the dilution method of sewage disposal within permissible limits which he has tried roughly to outline above, he is aware that many American towns and cities are likely to grow to proportions where the dilution method will require more and more complete treatment of the sewage in order to be satisfactory. He believes that it is the part of wisdom to prepare designs for sewage disposal works so that if filtration is not needed at the outset it can be adopted as conveniently as practicable in later years and without embodying too great a sacrifice in works now undertaken. This means, among other things, that intercepting sewers, sites for screening plants, and sedimentation tanks could well be arranged with the idea that some day filtration also must be provided. If this were done it would probably save considerable money that otherwise might be lost.

Relaxations—In England the author found the principal topic of conversation among engineers to be the forthcoming report of the Royal Commission on Sewage Disposal and the disposition in that report to provide for "relaxations." By this is meant that there would be installed, piecemeal, works which would provide ultimately for purification to the degree set out by standards recommended by the commission a few years ago. It is proposed now to take full reasonable advantage of dilution, but to arrange the works, so that further and more complete treatment may be secured when and as required in the future. This is a reasonable programme, and it is what has been thought of by the writer in connection with a number of recent problems in this country and also when the remarks above with respect to "comprehensive designs" were made.

Separate Sewers

So far as household wastes are concerned in all new systems and in many cases of extensions to existing sewer systems, it will be helpful to adopt the " separate system" to a greater extent than has been the vogue hitherto. The prevention of a mixture of the sanitary wastes of the household with the storm water from the streets will aid materially in minimizing the expense and in increasing the success attending sewage purification, sewage treatment, and the utilization of the dilution method within safe practicable lines.

Summary

It is permissible to dispose of sewage by dilution provided that complications can be prevented so far as disease germs are concerned, and this should be best done in connection with water filtration, and further provided that offensive conditions to sight and smell do not result.

In some large streams, as in lower Mississippi near New Orleans, sewage which is passed through coarse screens may with care be disposed of in a satisfactory way. In large lakes, tidal estuaries, moderate and small streams, it is important, if not necessary, for the success of maintaining "clean rivers" or " clean bodies of water" to free the sewage from floating and settling solids.

Permissible dilution of sewage without treatment in water courses with fairly high velocities range apparently from about 3.5 to 7 cu. ft. per second per 1,000 population, depending upon the manufacturing wastes in the sewage and the dissolved oxygen content of the diluting water. For well settled sewage, these limits become about 2.5 to 5 cu. ft. per second per 1,000 population according to present information.

Factors in the Problem of Highway Maintenance

HIGHWAY maintenance is an engineering problem as important as highway construction, but the failure to recognize its significance in the past has led many road officials to subordinate it to the execution of new work. Given only secondary consideration, inefficient administration systems have developed, and in consequence repair and maintenance have suffered greatly. Some of the defects in the highway organizations now in vogue, with possible remedies, have been pointed out by Dr. L. I. Hewes, chief of economics and maintenance, in a chapter on road management in a recent bulletin issued by the U. S. Office of Public Roads. The salient points developed in the chapter are presented in this article.

Viewing public roads as a whole, the defects of small administrative units are conspicuous. The number of men who have more or less authority and personal direction over road matters in some sections of the country is extraordinary. There are at least 150,000 such road officials in this country. The term of office of these men is but a year or two, and rotation in the office tends to be the rule.

It would seem that just where the stimulus of effective organization is most needed it is absent. The only successful attempts at systematic repair and maintenance on record are those which have been managed with skilled and strong central control. Almost without exception, those states which have undertaken state aid in any form for road building have, in the annual reports, reiterated the necessity of removing the responsibility of repair and maintenance of such roads from local authorities. In a number of states this change has been made, and the results have been an immediate improvement.

A fundamental difficulty with the organization of road systems which must handle repair and maintenance appears to be the failure to recognize that road work is a trade which requires training. Training for road work must necessarily be obtained at the expense of the community. As a rule, road officials are not in office long enough to mature their experience, and there is a constant economic waste of road funds.

Repair and maintenance operations upon all public roads necessarily extend over a period of years. In order to secure effective execution of such operations, a comprehensive plan for several years is necessary. The work for each season must be carefully laid out as far in advance as possible. Where maintenance work has been seriously undertaken under such a system it has responded with gratifying results.

Whatever the civic sub-division may be which constitutes the administrative road unit, a good road map showing all the various classes of roads is desirable. Realizing this, the state of New York has undertaken the preparation of a comprehensive atlas of all its roads. The roads are drawn uniformly ¼ in. in width at a scale of 1 mile to 3 in., which allows all culverts and bridges to be shown. The Ohio State Highway Department has issued a bulletin giving maps of all roads in the state by counties. In this also the scale is 1 mile to 3 in.

It has been found that the best results follow in an administrative district where the mileage of roads is sufficient to warrant the continuous employment of a man who is either a highway engineer or a competent road-builder, whose interest is primarily in road work, and who has actual charge of road matters in his district. Where such a man is employed from year to year he can select competent men for road work, and he is able to plan with confidence systematic improvements which must wait for successive annual appropriations.

Good business organization in road work demands an adequate bookkeeping system from which unit prices for various classes of work can be easily derived. Too frequently road accounting presents an accurate list of men to whom money has been paid for material or labor, but from which no estimate of the cost of future repair and maintenance work can be established.

Large jobs of repair are usually most advantageously handled by contract. Contract work must, however, be done under competent inspection and with proper plans, profile, and written specifications. Where road work is in continuous charge of one competent man it is possible for him to gain information from time to time which fits him to draw up proper specifications, avoid the repetition of mistakes, and benefit by the experience of other highway engineers. With a rotation of road officials there is little incentive for a man to familiarize himself with the best practice. He is not interested primarily in road matters and can not be expected to educate himself by reading road journals or attending road gatherings.

Value of Traffic Census

It will be more and more necessary in the future to study the service of various roads by accurate traffic censuses. From the investigations that have already been made it appears that for any civil sub-division a relatively small percentage of all the roads carry nearly all the travel. In France a traffic unit called the "collar" is used. The "collar" is a single horse harnessed to a vehicle, and all other traffic is reduced to "collars," including automobile traffic. The "collar" has not been adopted in the United States as a traffic unit. It is unfortunate, moreover, that no agreement exists among road men at present as to the detailed method of measuring traffic. Traffic censuses were taken in Illinois in 1906-7, in New York in 1909, and in Massachusetts in 1909 and 1912. These censuses counted the travel, but no common unit is yet available for reducing such traffic data; moreover, the useful tonnage is a most important item from an economic standpoint, and it is seldom counted.

It is well established that an improved road draws to itself increased traffic. To determine the future use of roads, it will be necessary not only to know the travel passing over the road before improvement, but also to know the increase of travel which is likely to be diverted to the road when it becomes improved. It is undeniable that travel upon roads in general is rapidly increasing numerically in tonnage and in mileage of travel radius. Preliminary study is clearly necessary, therefore, to enable road men properly to relate the first construction costs to probable maintenance charges. There should be an ample "factor of safety" in road design to allow for increased service.

Under a competent and continuous administration there are many details which can be worked out for road betterment which are otherwise neglected. It is necessary for economy to have the location of deposits of all road material within a road district placed on the road map and the quality of each deposit carefully recorded. The care of all road machinery should be in competent hands, and it should be housed and ready for use when the season commences.

A gradual improvement in the grades of more important roads can be undertaken with an established profile toward which some work is directed each year. It is quite probable that the prevailing lack of permanent culverts and bridges on highways is partly due to the unwillingness of short-term road officials to spend a considerable amount of money in one place. Under a continuous administration some permanent culvert or bridge work may be undertaken from time to time along a plan which contemplates the final improvement of all such structures.

Road Patrols

It is probable that the continuous employment of road patrols will be too expensive for a large part of our road mileage for some time to come. It is equally true, however, that on many miles of road the presence of a road patrol at a cost of from $60 to $75 per month will be economy. It has been repeatedly observed that the work of such road-men in preventing water breaks and wash from rainstorms and thaws at the right time has in itself justified their salaries. A continuous maintenance gang of foreman and eight or ten men, with suitable equipment, is a practical and economical maintenance force for county-road systems, aggregating 100 miles or more, where a patrol system can not be economically established. Whatever system of road labor is adopted, the work should be organized early in the year and experienced men developed and retained as far as possible. The foreman of a repair gang on road work should have sufficient knowledge and experience to justify spending his entire time in supervising and planning the work without attempting to labor with his men. The element of thoroughness in details, such as complete cleaning of mud holes, sufficient material, swift repair of water breaks, etc., can not be over-emphasized. There is always enough necessary planning and supervision to keep a good road foreman occupied.

The supply of road material for repair and maintenance operations should be at frequent intervals along all roads—for example, there should be sufficient broken stone of both sizes and screenings at hand on all macadam roads, and the quantity should be known. With the increased use of bituminous material it is necessary also to supply at convenient intervals stores of such material, and men working on the roads must be furnished with necessary small tools, including tar kettles, heating apparatus, pouring pots, and stiff push-brooms.

European Practice

On the continent of Europe and in England, where road repair and maintenance have been conspicuously successful, it has been the practice to issue printed instructions covering the smallest detail to all men engaged in the work. It is also the plan to require reports of work done and of quantities of material used at frequent intervals, and sometimes daily. Roads are frequently inspected and accurate estimates of all quantities of work are made from year to year.

The superiority of the French road system is not due to any extraordinary natural conditions or advantages but to the efficiency of the administrative organization. The basis of the administrative system is the publicly maintained Ecole des Ponts et Chaussees, where the road engineers and officials receive their technical training. A regularly recruited corps of trained and experienced men is thus constantly in charge of all the important roads. The department of the Ponts et Chaussees constitutes also a centralized source of information concerning the roads of the entire country.

For the purpose of road maintenance and construction the organization is as follows: (1) Inspectors-general of bridges and highways; (2) chief engineers, charged with the work of a "department"; (3) ordinary engineers and under engineers, charged with an "arrondissement"; (4) principal and ordinary conductors, charged with a sub-division; and (5) cantonniers, each having from 4 to 7 km. (2.48 to 4.05 miles) of highway under his immediate supervision.

Long-Term Bond Issue

Repair and maintenance have not been given sufficient consideration in planning road finances. It is becoming yearly more common for local authorities to issue bonds for road construction. During 1912 nearly $29,000,000 in bonds were issued by counties and road districts in various parts of this country for road construction. It is not uncommon to find such bond issues planned with no provision whatever for a repair and maintenance fund. No road can last thirty years without repairs, yet thirty-year bonds are repeatedly issued for road improvement. Many such bonds are commonly issued and the proceeds are expended without adequate supervision and under weak administrative systems. Every bond issue should be accompanied by a direct tax providing sufficient revenue for the upkeep of the roads with a good margin of safety, and the term of the bond should in most cases be shortened. Without doubt a serial bond is to be preferred to the form of retirement by a sinking fund. Serial bonds may be arranged so that the annual tax for interest and retirement is constant. With a serial bond there is a large percentage of the road actually paid for before it is worn out, even with long-term issues.

There is apparent contradiction in the cost figures for repair and maintenance exhibited by expenditures on roads of a given class as a whole and the figures obtained by analysis of the cost of necessary operations on a given type of road. On a 15-ft. bituminous-macadam road an annual charge of $700 a mile is nearly 8 cents per square yard. Although the cost of repair and maintenance in a number of states has recently averaged above $700 per mile, the annual cost of necessary operations for repair and maintenance by any given method is, on an average, considerably less than 8 cents per square yard.

The apparent contradiction is partly due to the excessive accumulation of resurfacing charges. Resurfacing charges have recently risen because of the particular phase of average-life period reached by a large mileage of state-aid roads and because of the emergency created by the new traffic, and especially because of the combination of the two causes. Insofar as surface treatment is absolute maintenance this present prevalent method of maintenance includes the former annual resurfacing charges which ordinary macadam roads required, but which for a number of years did not appear in the repair and maintenance figures. The present years are, therefore, bearing out not only accumulated past resurfacing charges, but are now carrying an increment of annual cost directed toward the increased life of the new road surface.

Assuming the cost of bituminous resurfacing at 72 cents per square yard; the annual maintenance, including necessary surface treatment, 4 cents; and the total annual charge for ordinary macadam resurfacing and maintenance, 5.9 cents; then if it is desired to find the number of years, n, a road reconstructed with bituminous surface must wear, without resurfacing but with regular surface treatment, in order that the total annual cost shall be the same as for ordinary macadam, there results from the above figures $(72 + 4n) \div n = 5.9$, whence $n = 37.9$ years, nearly.

It is possible that considerable resurfacing of bituminous-bound macadam roads will ultimately be necessary, and in this case there will be a rise in repair costs when the life period is reached. Maintenance of roads subject to automobile traffic tends more and more to become absolute maintenance. Not only does automobile traffic become increasingly destructive to a road which is once allowed to ravel, but the reaction of road surfaces upon automobile tires is now a matter of much importance.

Increased knowledge is needed of the actual relations between first costs and interest and of the life, service, and maintenance cost of the road. In future investigations for determining the type of road to be built it will be necessary to provide for large increases in traffic and carefully to balance the advantages of long-lived road surface, with little or no factor of safety and immediate and high maintenance costs.

U. S. Delegate

Among the notable delegates at the Third International Road Congress at London was Mr. Robt. Foote Hall, who went as a representative of the Universal Portland Cement Company and was also commissioned by the Department of Agriculture of the United States as a collaborator with the Office of Public Roads, Washington, D.C.

Mr. Hall is the son of Brigadier-General Robert H. Hall, of the United States Army. He was born at San Antonio, Texas, on August 24, 1870, and until leaving home for school and college, lived at various military outposts with his father. He graduated at the University of Michigan in 1894 and received the degree of LL.B. in 1895. He began the practice of law in Chicago in 1895 but later abandoned the legal profession to engage in business. At the present time he is assistant sales agent for the company which he represented. Mr. Hall is a member of many important clubs and organizations, including the University Club of Chicago and the Military Order of Loyal Legion of the United States. As a member of the Illinois Highway Improvement Association he has been active in the campaign of that state for good roads and has delivered many addresses on the subject.

Mr. Robt. Foote Hall, Chicago.

Western Building Reports

Regina

Building operations show considerable activity in the city of Regina. Plans are in preparation for the building of a new Anglican Synod House. The Scott Fruit Company are erecting a $25,000 warehouse three storeys in height. The cement basement is to be provided with double walls for cold storage purposes. Knox Presbyterian congregation has purchased land for the erection of a $37,000 school. The city authorities are undertaking considerable work and are calling for tenders for the construction of 500,000 square feet of concrete sidewalk. Plans are being called for the addition to the city hospital and for the construction of a new isolation hospital. A company has been organized in the city for the purpose of constructing and operating a flax mill with a capacity of 1,000 bushels of flax per day. The mill is estimated to cost over $100,000.

The new Sherwood million dollar department store is well under way. Excavation has been completed and the steel work started. Mr. Chas. D. Oliver, Canadian representative of the system M, has the contract for the steel work in his hands. This is said to be the first building erected in Canada on this system. The columns, girders and beams used in the building are composed of structural steel used in tension only, strength in compression being developed by the surrounding steel work. The building, which will be three storeys in height, will cover an area of about 1½ acres. The footings and steel work are calculated to carry five storeys as it is proposed to add another two storeys as soon as the business of the firm warrants it. The street front will be ornamented with terra cotta work and ornamental iron. All the modern conveniences found in the largest stores on the continent will be installed. Pneumatic cash tube system, post office, railway, express and theatre ticket offices will be among the innovations. There will also be found in the equipment rest room, writing room and hospital. Furnishings throughout will be in mahogany. Messrs. Brown & Vallance, of Montreal, are the architects.

Sherwood Building, Regina.

Messrs. Clemesha & Portnal have been awarded first prize in the competition for supplying plans for the Regina proposed city police station. The building will be three storeys in height and in addition to the cells will provide a parade room, office, gymnasium, waiting room and detention rooms.

Winnipeg

Ten million two hundred and fifty thousand dollars is the total building permits issued up to July 17th this year for the city of Winnipeg. Two new sub-postal stations, one in Fort Rouge district and the other on Portage avenue west are to be constructed during the summer. Mr. Chas. F. Roland, Commissioner of the Industrial Bureau, says that the city is about to experience a manufacturing development. Numerous enquiries are coming in from the United States and England with regard to sites and possibilities. The enquirers include one from a Connecticut firm asking advice in regard to the establishment of a malleable iron foundry, one from a Chicago firm concerning the manufacturing of a general line of elevators and conveying machines, several in regard to the manufacture of automobiles and motor cars. From England information is sought with regard to the establishment of motor car and motor boat manufacturing and also the manufacturing of leather goods. Perhaps the most promising from the Homeland is the investigations being made with regard to the establishment of a rope, binder twine and machine packing factory.

Prince Albert

A plant to be erected by the Imperial Steel & Iron Company of this city is under way. When completed the works will be capable of handling 4,000 tons of iron per month and will employ from six to seven hundred hands. The site covers 31½ acres and the buildings in all number eleven. Among the various departments there will be established a jobbing sheet and plate mill, a horseshoe factory with electrical equipment, a finishing mill, a scrap, shearing and preparing department, provided with seven pairs of shears, the largest capable of cutting six inches of cold steel, and a power house.

Edmonton

That the building trades are busy in Edmonton may be ascertained from the fact that the permits for the month of June totalled $1,428,650 and included 104 residences. Alterations involving the building of fifty rooms will be made in the Windsor Hotel. Mr. James Ross, president of the Ross Bros. Hardware Company, is having plans prepared for an apartment house costing $140,000. The building is to be erected this season. Shubert & Company, of Edmonton, have made arrangements for a $50,000 6-storey modern office building. Considerable municipal work is contemplated. Mr. W. L. Richardson, Director of Technical Education for the city, has recommended the erection of seven buildings near the High School. Some 225 men are at work on 43,000 feet of sewerage now being built.

The Governor of North Dakota in solving the good roads question by the plan of issuing bonds, paying the interest from an automobile tax, increasing the latter from $3 to $5 per year, so a part of the principal can be used each year, is generally indorsed by advocates of good roads in this state. The plan overcomes many of the objections advanced against other suggestions for raising funds for good roads in that it makes the automobiles pay for the entire improvement. The fact that it eliminates the protests of the farmers who object to special taxation for road purposes is expected to be a strong feature in securing its adoption. Despite their vital interest in good roads, most farmers of the state strenuously object to an increase in road taxation. Educational campaign for good roads has never been very systematically worked up and it will take some time to create sentiment favorable to direct taxation.

Several large works are in prospect in the city of Wellington, New Zealand, the chief being the new Roman Catholic cathedral (to cost £110,000), a new building for a large commercial firm (about £4,000), and a new government railway terminus.

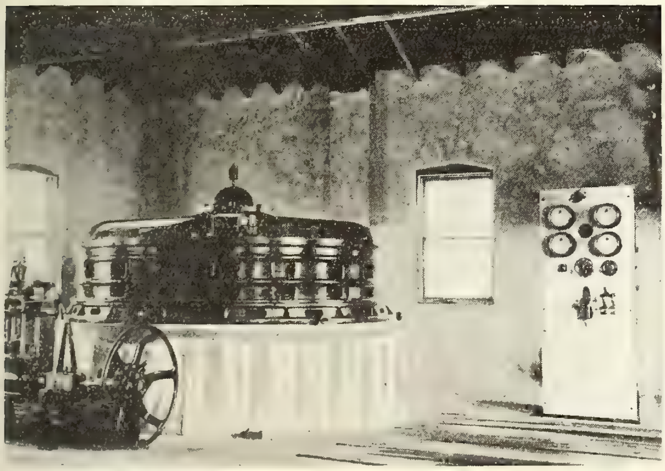
The Walkerton Electric Light and Power Co.

New Hydro-Electric Plant on the Saugeen River, Two Miles Above the Town

The Walkerton Electric Light & Power Company of Walkerton, Ont., have just placed their new hydro-electric power station in operation. The new plant is situated about 2 miles above the town of Walkerton on the Saugeen River, where a substantial concrete dam has been built, giving a normal head of 9 ft. The power house has been built about 800 yards below the dam by which arrangement an additional head of approximately 3 ft. is obtained, so that a normal working head of 12 ft. has been secured.

New power house—Walkerton

The plant at present consists of a 150 kw. 2300 volt, 3-phase, 60-cycle generator operating at 120 r.p.m. The generator is a Swedish General Electric vertical type machine, with ball thrust bearing carrying the weight of the rotor and water wheel runner. The water wheel, which is direct connected, is William Kennedy manufacture. The exciter is a separate unit of sufficient capacity for a duplicate alternator, for which provision has been made in the power house.



Generator, switchboard, etc.—Walkerton

The Power Company are at present installing additional 125 street lamps. An order has also just been placed for a second machine of 75 kw. capacity which will be installed in the old power station and will be used for light load service as it is the intention to give a 24-hour supply. All the electrical equipment has been supplied and the new generator will also be furnished through Messrs. Kilmer, Pullen & Burnham, of Toronto.

Linking Up the Canadian Northern Transcontinental Lines

The Dominion of Canada will soon be equipped with a second completed transcontinental railway line. The process of building the Canadian Northern Railway has been unlike that by which the other transcontinental lines have been developed. It has been the policy of the Canadian Northern Company to build or acquire lines in widely separated parts of the Dominion and then in the course of time to link up these lines to form a continuous road.

Their first line was built from Gladstone to Dauphin, Man., in 1896 and since that more than 4,600 miles have been built from Port Arthur on Lake Superior to Edmonton Alta. In eastern Canada lines were acquired in Ontario and Quebec. To give a continuous line from tide water at Quebec to tide water at Vancouver, a great amount of railway construction has been undertaken and much has been completed. A line was built from Toronto north to Sudbury and beyond to Ruel. Another line was started from Toronto east to Ottawa. This latter line is nearly complete. Less than ten miles of track are yet to be laid. The portion connecting Sudbury with Port Arthur, and hence with the lines in the west, is almost complete and the construction men of the company assert that the line will be finished before December 31st. From Edmonton to the Pacific Coast the work is yet under way. By the end of July it is expected that steel will be laid to Albreda Summit through Yellowhead Pass, a distance of 350 miles from Edmonton. From Port Mann, situated at deep water on the Fraser river, grading and bridge work is so far advanced that the track layers should be at Kamloops, 243 miles on the way towards the Yellowhead Pass, towards the end of December. More than 80 per cent. of the grading in the direction of Kamloops and the line extending to Vancouver from Edmonton has been finished and 50 per cent. of the steel is laid. Early in June active work commenced on the line from Port Mann to New Westminster. This is but a short distance and is a part of the railway into Vancouver. The entrance to this latter city will include a tunnel 4 miles long to False Creek flats where the Canadian Northern Pacific passenger terminals will be located.

New Dock on Burrard Inlet

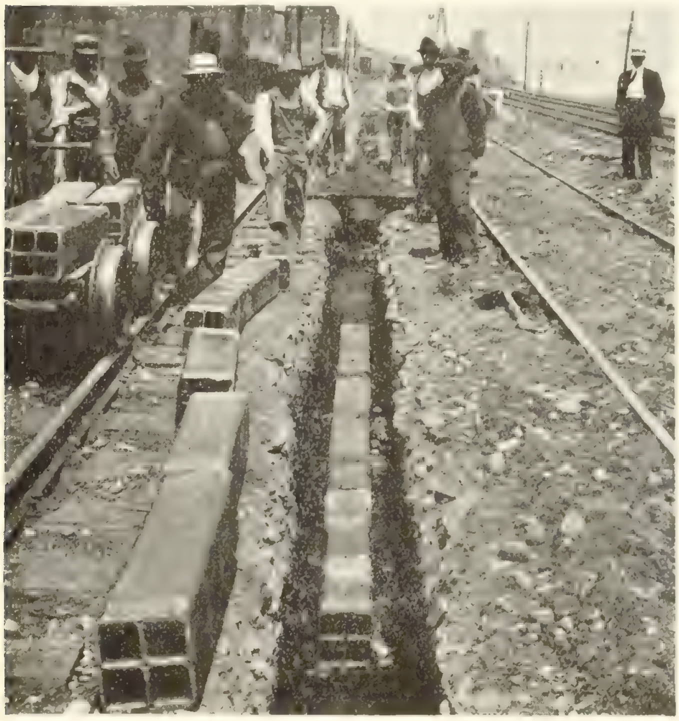
Additional details regarding the new public dock to be built by the Dominion Government on Burrard Inlet, between Salsbury and Commercial drives, at a cost of $500,000, have been made public. The dock will be of reinforced concrete with a concrete superstructure, and will be 800 feet long and 300 feet wide. Earth is to be excavated to a depth of 35 feet with reinforced concrete ribs, which may be filled with stone ballast. The coping of the dock will be 22 feet above water. It is expressly stated in the specifications that the excavations of earth and rock be removed by two separate operations of ordinary dredging and blasting, and the contractor will be paid at so much an hour a head for what material he actually removes. There will be a depth of 36 feet in the slips on each side of the slips. It is planned to build the dock in concrete stations 100 feet long and 39 feet high. These sections will be floated into position and then sunk at their proper places. Bulkheads of 12 by 12 timber will face off the dock. An interesting feature of the specifications is one providing for artificial light to enable night work to be carried on, which shows that the government intends to rush the work to completion in the shortest possible time. Bids will be received up to August 21.

The German Society of Engineers voted to present the Grashoff Memorial Medal to George Westinghouse, the inventor, of Pittsburg, Pa. Count Ferdinand Von Zeppelin is also a holder of this medal.

C. P. R. Conduit Construction

With a view of eliminating the overhead transmission lines of the C. P. R. telegraph company and simplifying the signal system in the yards from Delorimier Avenue and Notre Dame Street to Ontario Street, Montreal, the C. P. R. decided to lay conduits between those points. It is obviously difficult to handle signal work in a large railway yard from overhead construction; conduits do away with delays from ice and snow inevitable in pole work, and although the capital cost is larger, the maintenance charges are by no means as heavy. The contract was carried out by Dietrich, Limited, Montreal.

The whole installation is located between two main lines entering Place Viger station, and involved work under two bridges and over one subway. This point is a particularly busy one, and with the railway service being carried on during the entire period, the work was one of more than ordinary difficulty. The conduit is approximately one mile in length, and consists of 4-way vitrified clay duct laid in a complete envelope of concrete 3 in. thick. There are 16 concrete manholes 4 ft. x 5 ft. x 6 ft. inside measurement. The manhole space varies from 75 ft. to 575 ft., due to leads being taken off most of the manholes in order to operate the automatic signal system in the yards.



Laying Conduit in Hochelaga Yard, C.P.R., Montreal.

Almost from the start springs and quicksands were encountered, this necessitating the carrying of a 6 in. glazed tile drain for a distance of 2,600 feet. The drain was carried at a uniform depth of 6 feet from the surface, the entire yard being a grade of about one per cent. Fifteen pair 14 gauge, lead-covered, paper-insulated cable is used throughout.

Dietrich, Limited, have also completed the laying of two conduits in Toronto for the C. P. R. telegraph department. One on Dundas street west, Toronto, was notable for the large number of springs and quicksands, which involved the use of sheet piling throughout the job. In the other conduit, on Yonge street, the difficulty was due to the many wires and pipes. Besides gas and water mains, there were the lines of the Toronto Hydro, Toronto Electric Light Company, and the Bell Telephone Company, and a place had to be found for the C. P. R. conduit between these various wires and mains. The difficulties, however, were overcome, and the job successfully completed.

Further Plans Approved

The Quebec Public Utilities Commission, sitting in Montreal, have approved further plans of the Electrical Service Commission for placing wires underground. The conduits approved will be a continuation of those now being laid on St. Catherine street by Mr. G. M. Gest, the new section being from Guy to Atwater avenue; while the other conduits passed will run under Bleury street and Park avenue (from Craig street to Pine avenue).

Dr. Herdt, the chairman of the commission, explained the plans, stating that they might have to be varied a little as a great many obstructions were encountered that were not found in the city's records and street plans. At the corner of McGill College avenue and St. Catherine street (Mr. Gest's contract) they had an unusual amount of trouble on account of sewers and other pipes and conduits.

The new plans having been approved, tenders will be called for the construction of the conduits. The plans for the additional section of St. Catherine street are similar to those now being carried out, but a different system has been adopted for Bleury street. In conjunction with the civic conduits, one will be constructed for the Bell Telephone Company, the ducts being separated by 6 in. of concrete. The work will be carried out under the supervision of the Commission, the Bell Telephone paying the cost. In the civic conduits there will be a main run of 28 ducts with other laterals on the west side of the street, with a feed across at certain intersections to manholes on the east side, thence north and south for certain distances under the sidewalk for serving each building.

In connection with the Bleury street plan, a new lighting scheme will be installed, consisting of 41 standards. Police patrol and fire alarm standards will also be erected.

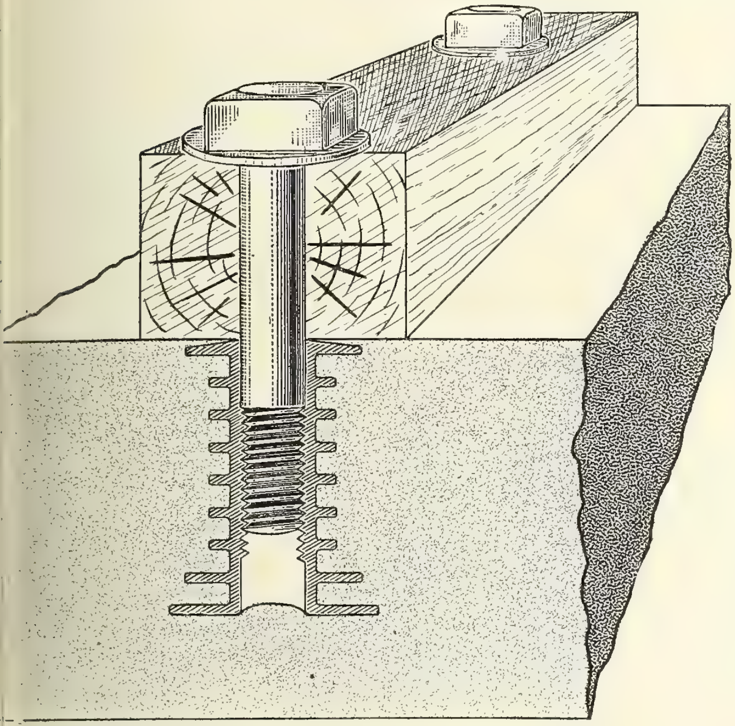
Westmount Conduit Work

The Westmount, P.Q., Council have awarded a contract to R. T. Smith & Company, Montreal, for the construction of a conduit on Western avenue. The conduit, designed by Mr. G. W. Thompson, the general manager of civic affairs, will be constructed of vitrified clay ducts, of 3½ in. square bore, and will cost about $25,000. It is probable that, in the future, the conduit will be linked up with the system which is now being carried out by the city of Montreal, under the direction of the Electrical Service Commission. Wires for the police call, lighting, fire alarms and any other lines through the city that may be required will be placed in the conduit. Manholes will be built in every section of the conduit. The ducts will be purchased by the council, and R. T. Smith & Company will carry out the work of laying. It is intended that the Western avenue conduit shall form part of a general system for the city, which will involve the removal of the poles. The amount to be expended at the present time will be charged to the surplus arising from the electric lighting department, and for this purpose the amount set aside against depreciation of the electric plant will be reduced from eight to four per cent. annually.

In connection with the scheme, the city are installing on the same avenue 50 standard inverted magnetite arc lamps, manufactured by the Canadian General Electric Company. These are 14 feet high, and will replace the present bracket arc lamps.

Fastening Masonry to Concrete Ceilings in Factories

Many engineers and those interested in the building and using of concrete ceilings for factories, will appreciate the practical working features of a plan herewith illustrated for installing threaded inserts at regular intervals in ceilings when the mixture is being poured, the threaded devices being then available after the wood forms are removed and the concrete hardened for fastening 2 x 4's or 4 x 4's in any layout desired.



Cut through section, 4 x 4 fastened by inserts.

The finish is neat and does not detract from the smoothness of the wall and is better than any plan which involves drilling holes after the concrete has hardened. The insert acts as a re-inforced hole as strong as the ceiling itself.

The illustration shows a cut-through section of a 4 x 4 fastened by means of the inserts and ordinary machine bolts. The 4 x 4 is attached every two feet. Shafting or machinery is then fastened to the timbers in the ordinary way.

One prime advantage of including this arrangement of inserts in plans for a factory ceiling is that the timbers can be changed around or replaced with little trouble and without drilling new holes, and greater strength and security is obtained.

Personal Mention

Messrs. Robert W. Hunt & Company, Limited, announce that Mr. C. W. Gennet, Jr., has assumed the duties of Treasurer and Manager at their principal office in the McGill Building, Monteral. Mr. Gennet has heretofore been in charge of the parent Company's Bureau of Inspection of Rails and Fastenings at the home office in Chicago.

Arthur H. Blanchard, M. Can. Soc. C. E., Professor of Highway Engineering in Columbia University, has returned from Europe where he attended the London Congress of the Permanent International Association of Road Congresses as a delegate from the State of New York and several societies. After the adjournment of the Congress Professor Blanchard made an investigation of various pavements and roads in England, France and Germany.

Many engineers and contractors whose business relations have brought them in contact with the Hamilton and Toronto Sewer Pipe Company will hear with profoundest regret of the death of Mr. Daniel New, for several years president and managing director of the above company. Though in ill-health for the past year Mr. New was not kept from active work until a few weeks ago. His death occurred on Thursday, July 17. One son, Mr. Hyland H. New, and a brother, Mr. Jno. New, both of Toronto, survive, as well as a brother in Hamilton.

Chief Architect Ewart, of the Public Works Department, has left Ottawa for a trip of official inspection which will take him across Canada. Mr. Ewart will go as far as Vancouver and will stop at all places where important public works are in progress and look them over. The department has at present several large undertakings under way in the west and more of them planned, such as large dry docks on the Pacific coast, internal storage elevators at various western points and some large public buildings.

The following are among the Canadians who registered recently at the Office of the High Commissioner of Canada in London:—Mr. W. E. Robertson, of Messrs. R. Robertson & Sons, Limited, contractors, Toronto; Mr. W. F. Tye (Past President of the Canadian Society of Civil Engineers), Toronto; Messrs. A. T. Laing, John McGowan and Peter Gillespie, of the University of Toronto; Messrs. A. R. Holden and R. C. Holden, Montreal, and Mr. David C. Dick, of Coburg, Ont.

Builders' Exchange Picnic

The annual picnic of the Toronto Builders' Exchange, held Tuesday, July 22nd, at Queenston Heights, was a most enjoyable outing. About two hundred members and their families left on the nine o'clock boat for the Heights. Upon their arrival luncheon was eaten and the amusements followed. Races which gave all ages and both sexes an opportunity to display their fleetness and skill were run off. Perhaps the most exciting event was the baseball match between the East and the West. The East was captained by Mr. Chas. Bulley, and the West by Mr. J. M. Scott. After six strenuous innings the West was declared winner by a score of 17 to 10. The party returned to Toronto by the nine o'clock boat delighted with their outing on the historic Canadian field.

Mainly Constructional

The News in Brief—From Coast to Coast

The Montreal Board of Control has voted the clerks in the building department an increase of $50 each, the assistant building inspectors $100 each, and the plumbing inspectors from $75 to $100 each.

The new Equitable Life Insurance Building in New York, 38 storeys high, will contain approximately 36,000 tons of structural steel, the inspection of which, both mill and shop, has been intrusted to Robert W. Hunt & Company, general offices, Chicago.

An English company has made a proposal to the city of Toronto that the new mechanical filtration plant be installed adjoining the main pumping station at the foot of John street. They offer to put in a complete plant at a cost of $1,500,000.

Building permits at Winnipeg for the year have exceeded $10,000,000. It is expected that the work of erecting the Pantages Theatre, which will cost $180,000, will soon be proceeded with.

The Dominion Brick Company, Limited, of Tofield, Alta., has completed the installation of its machinery and is proceeding with the manufacture of brick. The company anticipates the initial output to be 20,000 per day.

It is expected that the total value of assessable real estate in Montreal for the current year will reach approximately $725,000,000. As a comparison it is interesting to note that the figures in 1904 and 1909 were $207,338,500 and $329,933,900 respectively.

It is stated that the city of Edmonton needs over $60,000,000 to carry out local improvement work generally and that $15,000,000 of this is urgently required. This latter amount includes $6,000,000 for sewers, $4,500,000 for paving and $3,000,000 for water.

Tracklaying crews of the Grand Trunk Pacific will reach Smithers, the first division point east of Prince Rupert, in a few days, according to the latest reports of construction engineers. The new transcontinental line is expected to have trains running regularly between this point and Prince Rupert before the close of August.

The city of Toronto will install a new garbage disposal system next spring at a cost of one million dollars. The systems calls for the construction of an incineration and reduction plant, together with four loading stations. It is estimated that the cost of operating for the first year will amount to $12,500 with a slight reduction after that.

We desire to acknowledge the receipt of the Municipal Handbook of the City of Toronto for the year 1913. This booklet contains a great deal of valuable information with regard to the city of Toronto, its officials and organizations. The matter is well arranged for reference and will prove very helpful to those requiring information concerning civic affairs.

A membership campaign is now being carried on by the Builders' Exchange of the city of Montreal, for the purpose of inducing builders to participate in the benefits of the organization. The campaign will continue until August 7. The membership in the Exchange stands at 300, but it is believed this number can be augmented by another 200 firms directly or indirectly connected with the building trade.

The civil service commissioners have announced that applications will be received up to August 4th from candidates qualified to fill the following positions in the inside division of the civil service of Canada. An assistant engineer in the department of railways and canals, subdivision A. of the first division, initial salary $2,800 per annum. An assistant civil engineer in the department of railways and canals, subdivision B of the first division, initial salary $2,400 per annum. An assistant civil engineer in the department of railways and canals, subdivision B of the first division, initial salary $2,100 per annum.

The Federal Government have awarded the contract for the proposed dry dock at St. Joseph de Levis, Quebec, to M. P. and J. T. Davis, at the price of $2,721,116, which was $700,000 lower than the estimates of the Government engineers. Messrs. Davis have the advantage of a large amount of plant on the ground, as they are the contractors for the sub-structure of the Quebec bridge and also for the Quebec section of the Transcontinental Railway. It is understood that two English, three Canadian and one American firms put in bids. The dock will be 1,150 feet long and 120 feet wide, and will accommodate two of the largest vessels on the St. Lawrence route.

The Dominion Government has expropriated over 200 acres of land in Grantham Township for the first section of the new Welland Canal. The price to be paid for some of the land will run as high as $1,000, while it is understood that the average price will be $500 an acre.

The architects who have been entrusted with the work of preparing plans for the new Union Station at Toronto, have just completed an extensive tour of the most modern stations in the United States in search of suggestions. Those engaged in this work are Messrs. H. R. Safford, Chief Engineer of the G. T. R.; J. M. R. Fairbairn, Chief Engineer of the C. P. R.; J. R. W. Ambrose, Grade Separation Engineer of the G. T. R.; G. A. Ross and H. G. Jones, of Montreal, architects, and J. M. Lyall, architect, of Toronto.

The G. T. P. mainline to Prince Rupert will be ready for business by the first of June, 1914, and it is understood that this connection with Montreal will be made over the Temiskaming Railway, the G. T. P. having obtained running rights over the Ontario Government system. A year later, or about the first of July, 1913, the G. T. P. trains will be able to enter Montreal over what will be practically their Montreal branch, which is being built by the North Railway Company, from the city to the crossing of the Transcontinental at Bell River.

An order has been placed recently by the Grand Trunk Railway for 75 of the most up-to-date locomotives. Fifty of them will be used on the Canadian lines, while the other 25 will be used in the United States. These locomotives will be of the most modern type, and the largest in the country. They will cost $25,000 each, so that the company will pay out $1,875,000 with the next year for motive power. Most of them will be built in the Montreal shops, and some in Philadelphia. The work will entail the employment of many hundreds of men.

The first work of building and developing, on an extensive scale, public highways through the timber country near Fort William and Port Arthur has proved even more successful than had been anticipated either by the Ontario Government, which has projected the development, or the men who are supervising . Some two hundred men and forty teams are now constructing and putting into shape roads in the vicinity of Fort William. One highway that will be completed this autumn is the Pigeon River road, which will be run through to the international boundary, where it will connect with a road being built in Minnesota northward from Duluth.

The Ontario Provincial Government will build over one thousand miles of colonization roads this season. At present gangs totalling 4,500 men are pushing work with all possible speed. The work is in the hands of some 650 overseers, but it is the intention to increase this number to some 300. Three thousand additional men will be set to work cutting out, ditching and grading. The twenty provincial inspectors who have the oversight of the whole work report that the conditions, labor and constructive work were never more satisfactory than at present. Since the latter part of April 800 miles have been completed.

The rather unique and decidedly interesting catalogue of the Ceresit Waterproofing Company has come to hand. This catalogue should prove of very great interest to all users of cement. Since this latter form of building material has come into general use there have been many attempts to make it absolutely waterproof. The Ceresit Company claim to have accomplished this task. The company asserts for its paste that it is moisture proof, pressure proof and does not in any way discolor the concrete. The Ceresit Waterproofing Co. will be pleased to forward their catalogue to any sending in a request to their offices at 446 Commercial National Bank Building, Cor. Adams and Clarke Streets, Chicago.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Waterworks, Sewerage and Roadways

Brantford, Ont.

Cement walks, Echo Place, planned by Brantford Twp. Council from city limits to Echo Place. Clerk, J. A. Smith, Brantford.

Galt, Ont.

Huntingdon, Que.

Macadamizing roads for Village Council. Tenders received by Sec.-Treas., R. S. Feeny, until August 2nd, for macadamizing 4 miles roads. Plans, etc., at office of Sec.-Treas.

Laval des Rapides, Que.

Waterworks, cost $26,000, planned by Town Council. Engineers, Ouimet & Lesage, 76 St. Gabriel Street, Montreal. Pumping station, 1 electric pump, 70 h.p.; 1 gasoline pump, 70 h.p.; 1 electric pump, 20 h.p.; 1 gasoline pump, 20 h.p. Water pipes, filtration plant, etc. Specifications and plans at office of Engineers. Tenders called as soon as money is voted.

Montreal, Que.

Tenders received by Board of Commissioners, Secretary, L. N. Senecal, until August 5th for construction of a granite block pavement on Cote St. Paul Rd., from Notre Dame St. to Lachine Canal. Engineer, Geo. Janin, City Hall.

Roads and sewers planned, Mt. Royal Tunnel City. Mayor, T. S. Darling, 230 St. James St., Montreal. Tenders will be called about August 15th, for asphalt roads, stone supplied by owners.

Peterboro, Ont.

Sewer, cost $13,250, planned by City Council. Clerk, S. R. Armstrong. City Engineer, R. H. Parsons, City Hall.

St. Anicet, Que.

Tenders received by Sec.-Treas., Jos. Racine, until August 4th, for macadamizing 21 miles of roadway.

St. Hyacinthe, Que.

Gravity filters, cost $60,000, planned by City Council. Mayor, P. F. Ryan, Chairman Waterworks Board, Elie Bourbeau. Supt. of Board, A. Measier. Engineer, J. O. Meadows, c/o Montreal Water & Power Co., Montreal. Gravity filters, 2,000,000 imp. gals., sedimentation basin, 1 electric pump and 1 steam pump low life, each 2,000,000 gals. By-law to be submitted. Tenders will be called after August 1st.

Toronto, Ont.

Sewers for Board of Control. Tenders received by Mayor, H. C. Hocken, City Hall, until August 5th, for laying sewers on a number of streets from Beverley to Yonge, and from Yonge to Sumach. Plans at office of Waterworks Section, Dept. of Works, City Hall.

Welland, Ont.

Sewers planned by Town Council. Chairman Sewage Committee, James Hughes. Engineer, D. T. Black. Tenders received by Clerk, C. M. Webber, until August 4th. Separate sewers on Maple and Oakland Aves., William, Asher, River, Duncan, Cody and John Sts. Plans at office of Engineer and Contract Record, 220 King W., Toronto.

CONTRACTS AWARDED

Brockville, Ont.

Asphalt pavement, cost $20,000, Perth St. Mayor, John MacKenzie. Clerk, Geo. Dewey. Engineer, Geo. Bryson. General contractors, The Godson Contracting Co., Ltd., Manning Chambers, Toronto. For pavement from King St. to the G. T. R. a distance of 7 blocks.

Montreal, Que.

Electric pump, cost $6,356, High Level Reservoir. Engineer, T. W. Lesage, Supt. of Waterworks. General contractors, Can. Allis-Chalmers Co., 613 Can. Express Bldg. Board of Commissioners, Secretary, L. N. Senecal.

Water main, cost $8,400, McTavish, for Board of Commissioners. Sec., L. N. Senecal. Engineer, T. W. Lesage, Waterworks Dept. General contractors, Gilbert, Paye & Co., 2065 Chateaubriand.

Winnipeg, Man.

Asphalt pavement planned by Board of Control. Sec., M. Peterson. General contractor, J. W. Astley, Engineer of Construction, City Yards, at $676.45 for laying No. 2 asphalt pavement on Wentworth St. from Grosvenor Ave to 1st lane north.

Valves. General contractors, Drummond McCall & Co., Ltd., Montreal, for gate valves for connections to new 18,000 gal. reservoir. Two 18 in. gate valves, at $145; 1-30 in. gate valve, at $405; 3-36 in. gate valves, at $630. Board of Control. Sec., M. Peterson. Engineer, H. N. Ruttan, 223 James Ave.

Railroads, Bridges and Wharves

Aurora, Ont.

Bridge. Clerk, R. W. Phillips, 57 Adelaide E., Toronto. Engineer, Frank Barber, 57 Adelaide E., Toronto. Tenders received by Engineer until August 6th, for reinforced concrete beam bridge on Yonge St., North of Aurora. Plans at office of Engineer.

Calgary, Alta.

New C. P. R. stations will be built on the Vegreville-Calgary line at Rise Deer, Benyou, Redland, Rockyford, Barntill, Hawick, Lyall, Norfolk, Cheslermere Lake and Barlow. On the Saskatoon-Calgary Line at Excel, Cereal, Chiriook, Dobson, Youngestown, Stanmore, Richdale and Modena.

Bridges planned by City Council. Removal of Louise Bridge to 15th St., cost $82,000; concrete bridge at 4th St. W., cost $82,000; Bow River, concrete, cost $319,000, and 9th St. W., concrete, cost $173,000. By-laws to be submitted. Clerk, J. M. Miller. Engineer, Geo. Craig.

Cheverie, N.S.

Extension to wharf. Tenders received by Sec., R. C. Desrochers, Ottawa, Dom. Govt. Dept. of Public Works, until Aug. 14th. Plans, specifications, etc., at office of W. P. Morrison, Acting Dist. Engineer, Halifax, N.S., E. G. Millidge, Dist. Engineer, Antigonish, Postmaster, Cheverie, and Dept. Ottawa.

Elmwood, Ont.

Steel bridge, for Co. Grey. Tenders received by Alex. Wilson, Elmwood, until August 11th, for steel bridge and concrete abutments 90 90 ft. C to C. Plans at office of Henry Metcalfe, Hanover, and James Warren, Walkerton, Ont.

Inglewood, Ont.

C. P. R. Co. has been authorized to reconstruct bridge No. 18.1 near Inglewood station, Twp. Chingwacousy, Ont., Div. Orangeville Sub-div.

Island River, N.B.

Dredging, Gloucester Co., for Dom. Govt. Dept. of Public Works. Tenders received by Sec., R. C. Desrochers, Ottawa, until Aug. 5th. Plans, etc., at Dept., Ottawa.

Kenora, Ont.

Wharf. Tenders received by Sec., R. C. Desrochers, Ottawa, Ont., Dom. Govt. Dept. of Public Works, until Aug. 14th. Plans, specifications, etc., at office of F. G. Harcourt, Dist. Engineer, Port Arthur, J. G. Sing, Dist. Engineer, Confed. Life Bldg., Toronto, Postmaster, Kenora and Dept., Ottawa.

Langstaff, Ont.

Bridge. Clerk, R. W. Phillips, 57 Adelaide E., Toronto. Engineer, Frank Barber, 57 Adelaide E., Toronto. Tenders received by Engineer, until Aug. 6th, for reinforced concrete culvert.

Lansdowne, Man.

Bridge, over White Mud River, for Rural Municipality of Lansdowne. Sec.-Treas., M. E. Boughton, Arden, Man. For steel truss bridge over White Mud River, between Sec. 11, 12, 13, 14 and 15 miles south of Keyes Station C. P. R. Abutments and wing walls of reinforced concrete construction. Length 60 ft. Separate tenders may be submitted. Plans, specifications, etc., at offices of Sec.-Treas., and Dept. of Public Works, Winnipeg. Tenders received by Sec.-Treas. till 10 a.m. Aug. 6th.

McKillop Twp., Ont.

Drain planned. Tenders received by Clerk, M. Murdie, Winthrop, until Aug. 13th.

Metcalfe & Ekfrid Twps., Ont.

Improvements to "Kettlewell" tile drains planned. Tenders received by Clerk, Richard Ward, Strathroy, Ont., until Aug. 2nd.

Moose Jaw, Sask.

C. P. R. Co. authorized to construct

additional line, mileages 1-15.38 from Broadview. Div. engineer, T. Martin.

Newcastle, N.B.
Wharf, cost $10,000, contemplated by Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Engineers now working on plans.

Ottawa, Ont.
C. P. R. Co. has been authorized to construct spur for Watson & Todd, Ltd.

Province of Quebec.
Bridge, cost $6,000, over St. Francis River, for Municipal Council of D'Israeli. Mayor, D. Binet. Plans, etc., at offices of sec.-treas. One span, 100 x 17, concrete, steel and 4-in. rod pine.

Bridge, over Lacroix Creek, planned by Municipal Council, Gracefield Township. Mayor, T. W. Perras. Plans, etc., at office of sec.-treas., E. Mercier. One span, 180 x 17, concrete, steel and 4-in. red pine.

Bridge, over White River, for Municipal Council of St. Celestin. Mayor, Jos. Ed. Noel. Sec.-Treas., Calixte Doneau. Plans, etc., at office of Sec.-Treas. One span, 70 x 17, concrete, steel and 4 in. red pine.

Bridge, cost $5,600, Fraser Bridge, for Municipal Council of Cap St. Ignace. Mayor, A. Methot. Sec.-Treas., Jos. Boissinot. Plans, etc., at office of Sec.-Treas. One span, 100 x 17, concrete, steel and 4 in. red pine.

Bridge, over Island Brook, for Municipal Council of Newport Twp. Mayor, H. A. Stevenson. Sec.-Treas., A. S. Farnsworth. Plans, etc., at office of Sec.-Treas. One span, 30 x 28, concrete, 10-18 in. I beams, steel and 4 in. red pine.

Bridge, cost $3,000, over Senoscouk River, for Municipal Council of St. Hubert. Mayor, H. Dalloine. Sec.-Treas., Ep. Michaud. Plans, etc., at office of Sec.-Treas. One span, 45 x 17, concrete, steel and 4 in. red pine.

Bridge, over Red River, for Municipal Council of Coteau du Lac. Mayor, Dr. Elz. Deguire. Sec.-Treas., A. Dauth. Plans, etc., at office of Sec.-Treas. One span, 75 x 17, concrete, steel and 4 in. red pine. Plans drawn.

Bridge, cost $10,250, over large Creek, planned by Municipal Council of St. Hugues. Mayor, Jos. Picard. Plans, etc., at office of Sec.-Treas., W. Meloncon. One span, 30 x 16, concrete, 5-18 in. I-beams, 55 lbs., 34 ft. long, steel and 4 in. red pine.

Bridge, cost $4,400, planned by Municipal Council of Ste. Catherine. Mayor, J. Henchey. Plans, etc., at office of Sec.-Treas. One span, 40 x 17, concrete, steel and 4 in. red pine.

Bridge, cost $7,600, over Bain's Creek, planned by Municipal Council of Gracefield Twp. Mayor, F. W. Perras. Plans, etc., at office of Sec.-Treas., E. Mercier. One span, 60 x 17, concrete, steel and 4 in. red pine.

Two bridges, cost $11,000, over Harvey Canal, planned by Municipal Council of St. Henri de Faillon. Mayor, Philippe Villeneuve. Plans, etc., at office of Sec.-Treas., Jos. Marcotte. Three spans, 30 x 17, 75 x 17, 80 x 17, concrete, steel and 4 in. red pine.

Bridge, cost $7,000, over Peribonka Falls, for Municipal Council of St. Henri de Failon. Mayor, Philippe Villeneuve. Plans, etc., at office of Sec.-Treas., Jos. Marcotte. One span, 190 x 17, concrete, steel and 4 in. red pine.

Bridge, cost $6,100, Wattopkah River, planned by Municipal Council of Windsor Mills. Mayor, A. Frudeau. Plans, etc., at office of Sec.-Treas., J. A. Begin. One span, 140 x 17, concrete, steel and 4 in. red pine.

Bridge, cost $3,260, over Colbert Discharge, planned by Municipal Council of Baie du Febvre. Major, Octave Lemire. Plans, etc., at office of Sec.-Treas., N. U. Frechette. One span, 30 x 16, concrete, 5-18 in. I-beams, steel and 4 in. red pine.

Bridge, cost $4,300, over Green River, for Municipal Council of L'Ile Verte. Sec.-Treas., J. J. Lapointe. Plans, etc., at office of Sec.-Treas. One span, 125 x 17, concrete, steel and 4 in. red pine.

Rustico, P.E.I.
Dredging harbor. Tenders received by Secretary, R. C. Desrochers, Dom. Govt., Dept. of Public Works, Ottawa, until August 6th. Specifications and plans at Department, Ottawa.

Rochester Twp., Ont.
Eight bridges planned by Twp. Council. Clerk, M. N. Mousseau, S. Woodslee, Ont. Engineer, James Laird, Essex. By-law to be submitted Aug. 16th. Steel and concrete construction.

St. Catharines, Ont.
Electric railway for C. P. R. Div. Frt. Agent, E. N. Todd. City Council asked to aid construction of line from Hami ton to Niagara Falls.

Scott, Que.
Steel bridge, over Chaudiere River, for County of Beauce. Engineer-in-charge, L. A. Valloe, 80 St. Cyrille St., Que. Tenders received by Sec.-Treas. of Scott, until August 1st. Bridge over river between Parishes of Scott and St. Bernard, Beauce County.

Toronto, Ont.
Railway building, cost $28,000, West Toronto, planned for C. P. R. Co. New Repair shop. Steel, brick and concrete construction.

Station and viaduct, cost $5,000,000, planned for C. P. Rly. and G. T. Rly., Head office, Montreal. Architects, Ross & McDonald, 1 Belmont St., Montreal, and Traders Bank, Toronto. Work to commence about February, 1914. Brick, concrete and structural steel construction.

Scarboro Twp. will build new steel and concrete bridge near Scarboro Golf Club Grounds. Clerk, Thos. Crawford, Agincourt.

Vancouver, B.C.
Dock, cost $750,000, foot of Salisbury Drive. Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Plans, specifications, etc., at offices of C. C. Worsfold, Dist. Engineer, Victoria, Dist. Engineer, Confed. Life Bldg, Toronto, and J. L. Michaud, Dist. Engineer, Post Office Bldg., Montreal, Postmaster, Vancouver and Dept., Ottawa. Tenders received by Sec. till Aug. 21st.

Walkerton, Ont.
Bridge flooring for Town Council. Chairman of Commission, A. E. McNale. Tenders received by Chairman until Aug. 4th, for recovering East End bridge, steel and cedar flooring.

West St. John, N.B.
Dredging, for Dom. Govt. Dept. of Public Works. Tenders received by Sec., R. C. Desrochers, Ottawa, until Aug. 5th, for dredging at Wellington and Nelson Slips and Navy Island, St. John Harbor, N.B. Tenders to include towing of plant to and from the work. Specifications and plans at Dept., Ottawa.

Winnipeg, Man.
Station, cost $35,000, St. Boniface (Desmeuron St., for Canadian Northern Rly. Co. Two storeys and basement, pressed brick construction, stone foundation, tile and maple floors, shingle roofing. Plans drawn.

CONTRACTS AWARDED

Collingwood, Ont.
Dredging planned by Dom. Govt., Department of Public Works, Secretary, R C. Desrochers, Ottawa, Ont. General contractor, C. S. Boone Dredging & Construction Co., Ltd., 17½ Adelaide St. E., Toronto, Ont.

Colborne, Ont.
Station planned for C. P. R. Work in charge of B. Beatty, Coldwater. 24 x 98, frame and roughcast construction, cement foundation.

Digby, N.S.
Dredging. Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractors, Maritime Dredging & Construction Co., St. John, N.B.

Killarney, Ont.
Dredging, cost $8,000, Dom. Government, Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa, Ont. General contractors, C. S. Boone Dredging & Construction Co., Ltd., 17½ Adelaide St. E., Toronto, Ont.

Levis, Que.
Dry docks planned by Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractors, M. P. & J. T. Davis, Levis.

Ottawa, Ont.
Booster building, cost $6,000, Centre, for Ottawa Elec. Rly., Albert St. Architect, J. Albert Ewart, 193 Sparks St. General contractor and mason, Geo. Crain, Clemow Ave. Steel, Dom. Bridge Co., Sparks St. Tin, McFarlane & Douglas, 1250 Slater. Painting, Geo. Higman & Sons, 176 Rideau. Plumbing, McKinley & Northwood, Rideau. Electrical, Company.

Prov. of Quebec
Bridge, cost $22,500, over Jesus River, for Municipalities of Terrebonne and Ste. Rose. Mayor, Terrebonne, Ernest Mathieu. Sec.-Treas., Terrebonne, Amedee Jasmin. Mayor, St. Rose, Jos. Charbonneau. Sec.-Treas., St. Rose, Henri Chapleau. Plans, etc., at office of Sec.-Treas. Three spans, each 165 x 17, concrete steel and 4 in. red pine.

St. Catharines, Ont.
Welland canal, cost $3,500,000. Dom. Govt. Dept. of Railways and Canals. Sec., L. K. Jones, Ottawa. General contractors, Dominion Dredging Co., Ltd., 17½ Elgin St., Ottawa. Contract for Sec. No. 1 Welland Canal. Other tenders to be called shortly.

Stratford, Ont.
Bridge, cost $2,400, Romeo. City Council. Mayor, C. N. Greenwood. En-

gineer-in-charge, A. B. Manson, City Hall. General contractors, Stratford Bridge & Iron Works.

Public Buildings, Churches Schools, etc.

Calgary, Alta.

R. C. Diocese are contemplating erecting church and priests house on their property in west end of city. Architect has not yet been appointed.

Edmonton, Alta.

Club and apartments, cost $200,000, 2nd and Victoria, for Northern Club, Jasper Ave. Architects, Magoon & MacDonald, 604 Tegler Block. Work has stopped temporiarly. Seven storeys, 50 x 150. Foundations in.

Estevan, Sask.

Church for R. C. Congregation. Tenders received by Rev. C. Soquet from whom plans and specifications may be obtained.

Fort William, Ont.

Addition to orphanage, Franklyn, for Roman Catholic Denomination. Architect, H. Russell Halton, Room 7, Stanley Block, Port Arthur, Ont. Tenders received by architect. 3½-storeys, 50 x 100.

Fredericton, N.B.

School, cost $40,000. Sec., Chas. Sampson. Architect, F. Neil Brodie, 42 Princess, St. John. Two storeys, cement foundation, pressed and stock brick construction. Plans in progress.

Le Pas, Man.

Court house planned by Prov. Govt. Prov. Architect, V. W. Horwood, 261 Fort Street, Winnipeg, has been instructed to prepare plans at once.

Medicine Hat, Alta.

Public market, contemplated by City Council. Clerk, H. Baker. Debenture by-law to be voted on Aug. 12th.

Citadel, cost $20,000, for Salvation Army. Tenders received by Architect, Major Miller, Salvation Army, Toronto. Three storeys.

Milner, B.C.

Tenders received by Minister, Hon. Thos. Taylor, Victoria, Prov. Govt. Dept. of Public Works, until August 4th, for construction of a 2-roomed school building. Plans, specifications, etc., at office of S. A. Fletcher, Govt. Agent, New Westminster, R. A. Paynes, Sec. of School Board, Murrayville, and Dept., Victoria.

Montreal, Que.

Church and presbytery, cost $200,000, Delorimier and Gilford, for St. Dominic's Parish. Architect, Raoul Gariepy, 25 St. James St. Tenders will be received by wardens of St. Dominic's Church, c/o Architect. Two Oxford-Gurney 8 x 10 water boilers or equivalent and 1 galvanized iron boiler, 50 gal. required. 70 ft., 200 x 85, concrete, brick and Montreal stone foundation, Montreal rough stone, limestone, brick and steel beams, terra cotta, structural steel and cast iron templates.

City Hall alterations, cost $10,000, Longueuil (St. Charles). Architect, Alf. Prefontaine, Longueuil. Electric wiring to be done under supervision of Louis Lesuier, Town Engineer.

Booth memorial hospital, cost $150,000, Outremont (Outremont and Just Ave.), for Salvation Army, 341 University. Architect, Major Miller, 20 Albert St., Toronto. 3½-storeys, basement and wings, cement foundation, Montreal stone, terra cotta, tile and brick construction. Plans in progress. Work to start in spring of 1914.

North Sydney, C.B.

Church for Calvary Baptists. Chairman Bldg. Com., F. L. Kelly. Architect, Leslie R. Fairn, Aylesford, N.S. Tenders received by Chairman up to 8 o'clock August 20th for erection of church bldg. Plans and specifications with H. E. Whitman, Commercial street, North Sydney, and with architect.

Newcastle, N.B.

Sunday school, cost $5,000, for Presbyterian Church. Chairman of Committee, E. A. McCurdy. Wood or concrete construction, concrete foundation. Tenders will be called shortly.

Newmarket, Ont.

Building for County Industrial Home Commissioners. Plans, specifications, etc., at J. G. Cornell's Kingston Road, Scarboro, J. S. McNair's Elgin Mills, Commissioners, at the home, Newmarket, and at office of County Clerk, Toronto. Bulk tenders received by J. G. Cornell, Scarboro P. O. until Aug. 1st.

New Westminster, B.C.

Public building. Residential Architect, Wm. Henderson, Victoria. Tenders received by Sec., R. C. Desrochers, Dom. Govt. Dept. of Public Works, until Aug. 12th. Plans, specifications, etc., at office of Secretary, Architect or Post Master, New Westminster.

Province of Ontario

Three wireless telegraph stations, cost $25,000 each, planned by Marconi Telegraph Co., 137 McGill St., Montreal. Builders, Owners. Stations on Lake Ontario and Lake Erie, each includes 1 steel tubular mast 250 ft. high and about 2 ft. diameter, 2 residences, 8-rooms each, operating house, about 30 x 25, concrete construction, engines and dynamos 8 h.p. capacity.

Ottawa, Ont.

Theatre, Albert St., for J. H. Ferguson, 590 Gilmour St. Architect, A. L. Weeks, 75 Sparks St. Building to include theatre, stores, offices and apartments. Plans prepared.

Police station, cost $150,000 to $200,000, contemplated by the City Council. Chief Commissioner, Mayor, J. A. Ellis.

Addition to No. 1 Salvation Army citadel, cost $7,000, Slater. Tenders received by Architect, Major Miller, Salvation Army, Toronto. Brick foundation and construction.

Picton, Ont.

New hall, cost $4,000, for Salvation Army. Three storeys. Tenders received by Architect, Major Miller, Salvation Army, Toronto.

Point Grey, B.C.

Incineration for Municipal Council. Clerk, G. G. Heighway, Kerrisdale. Tenders received by Council at Kerrisdale till 5 p.m. Aug. 18th, 1913, for erection of incinerator of 25 tons, including smoke stack. Floors to be strong enough to carry 10-ton truck.

Quebec, Que.

Poultry building, Exhibition Grounds, planned by Prov. Govt. Exhibition Board. Architect, J. L. Pinsonneault, City Hall. Tenders will be called shortly.

Hospital for contagious diseases planned by the city. Architect, J. Leon Pinsonneault, City Architect, City Hall, Que.

St. Catharines, Ont.

Moving picture theatre, cost $5,000, St. Paul street. Architect, Joseph Daw, 165 St. Paul street. One storey, frame construction, 150 x 77. Plans in progress.

Sault Ste. Marie, Ont.

Addition to children's shelter, cost $10,000, contemplated by Children's Aid Society, Soo and Algoma. Building committee, Mayor T. E. Simpson, President; Dr. Shannon , M. Sherridan, R. Brydes, J. P. Reid, Inspector. One storey addition and wing, reinforced concrete and stone construction. Plans in progress.

St. John, N.B.

Incinerator, cost $55,000, for City Council. Clerk, H. E. Wardroper. Commissioner of Works, M. E. Agar. Work held up indefinitely.

Alterations and addition to court house, cost $100,000, for City Council. Clerk, H. E. Wardroper. Commissioner of Works, M. E. Agar. Three storeys, stone construction, etc. Indefinitely postponed.

Remodelling No. 3 army hall, cost $3,000, Bringley street. Tenders received by Architect, Major Miller, Salvation Army, Toronto. Three storeys, frame construction.

Toronto, Ont.

Library and entrance, cost $5,000, for St. Patrick's Church, McCaul street. Architect, J. P. Hynes, 199 Yonge St., tenders in. Contract will be awarded shortly. One storey, 24 x 32, structural steel and brick construction, cement foundation.

Church and sunday school, cost $50,000, for Howard Park Methodist Church, Sunnyside and Marmaduke. Architect, W. G. Burns, 74 Indian Grove. Tenders called in a week's time for masonry, carpentry, roofing and plumbing, other trades later. Two storeys, 54 x 108, steel, stone construction, stone foundation.

Lodging house, cost $100,000, Queen E., planned for Salvation Army. Architect, Major Miller, Salvation Army, Toronto. Fireproof construction. Modern equipped lodging house to accommodate 500 men.

Park pavilion, cost $3,500, High Park, planned by Parks Dept., City Hall. Architect, G. Gouinlock, Temple Bldg. One storey, 40 x 56, brick construction, concrete foundation. Plans drawn.

Alterations to church, cost $20,000, Arthur and Grace, for St. Francis R. C. Church, Arthur St. Tenders received by Architect, J. P Hynes, 199 Yonge St. One storey, 40 x 40, terra cotta, stone and brick construction, stone foundation.

Vancouver, B.C.

Industrial home, cost $30,000, Lansdowne Ave., for Salvation Army. Tenders received by Architect, Major Miller, Salvation Army, Toronto. Three stys.

Victoria, B.C.

Theatre, cost $125,000, Government and Comorant Sts., for Elliott, McPherson & Fullerton, c/o Architect, Jesse M. Warren, 503 Central Bldg. Blass B construction, brick and steel, 1 balcony, 14 boxes, latest ventilation system, steam heating, electric lighting, accommoda-

[illegible] for 1,000 people. Equipment required. Plans in progress.

Wallace, N.S.
School, cost $5,000, planned. Further information from Sec. School Board. Two storeys, frame construction, stone foundation, shingle roofing, hot air heating seating.

Welland, Ont.
High school, cost $60,000, West Main St. Sec., W. H. Lowe. Chairman, A. J. J. Brennan. Architect, D. J. Forbes, Temple Bldg. Two storeys, 130 x 67, cement foundation, brick, structural steel and artificial stone construction.

Winnipeg, Man.
Theatre planned for Canadian Provincial Theatres, Ltd. Manager, Wm. Hill, 901 Lindsay Bldg. Company intend to build chain of theatres throughout Canada.

New wing, cost $8,000, Balmoral Lodge, for Salvation Army. Tenders received by Architect, Major Miller, Salvation Army, Toronto. Three storeys.

CONTRACTS AWARDED

Armstrong, B.C.
Drill Hall, Dom. Govt., Department of Militia & Defence. Secretary, E. F. Jarvis, Ottawa. General contractors, Campbell & Wilkie, 615 Pender St. W., Vancouver, 40 x 80, brick construction.

Amherst, N.S.
Citadel, cost $6,000, Princess St., for Salvation Army, Toronto. Architect, Major Miller, Salvation Army, Toronto. General contractors, Victor Woodworking Co., Ltd. Three storeys, brick veneer construction.

Berlin, Ont.
Theatre, cost $125,000. Architects and Owners, Griffin Amusement Co., 8 Queen E., Toronto. Work will be done by day labor and will start about Aug. 20th.

Bury, Que.
Drill hall, cost $11,750, for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractor, Ayton Cromwell, Cookshire, Que.

Bridgeburg, Ont.
Moving picture theatre, Dufferin St., for Butler Bros., Chicago, Ill. General contractor, O. C. Teal, Bridgeburg. One storey, 30 x 100, frame construction. Foundations in.

Brockville, Ont.
Technical school addition, cost $3,000, planned by Board of Education. Builder and general contractor, H. Dunham. Two storeys, cement block construction, stone foundation.

Calgary, Alta.
Church, cost $25,700, Riverside, for German Evangelical Lutheran Church. Architect, Geo. Dowler, Alexander Corner. General contractors, Conrad Rohl, Box 1153. Two storeys, 46 x 110, brick construction, cement foundation.

Colgate, Sask.
School, cost $6,500, for Town Council. General contractors, Frank Rooney, Weyburn. Two storeys, brick construction, cement foundation.

Coquitlam, B.C.
School, Port Moody Road. General contractor, Charles M. Nicholson, New Westminster, at $1,190.

Chatham, Ont.
Renovating theatre, cost $50,000. Architects and Owners, Griffin Amusement Co., 8 Queen E., Toronto. The old Family Theatre to be completely renovated. Work will be done by day labor and will start at once.

Duncans, B.C.
Post office, cost $38,463. Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Res. Architect, Wm. Henderson, Victoria. Mason, Rourke, McDonald & Moncrief, 142 Hastings St. W., Vancouver.

Elmira, Ont.
Post office, cost $35,000. Dom. Government, Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa, Ont. General contractor, E. A. Bleakney, Gananoque, Ont. Three storeys, 132 x 66.

Edmonton, Alta.
Church, cost $55,000, Kinistino, for Sacred Heart Congregation. Architects, Hardy & Markland, 16 Victoria Block. General contractors, Turner Bros. and Clindinning, 10th Ave. N., S. Edmonton. Two storeys, 62 x 92, brick and structural steel construction.

Kingston, Ont.
Citadel, cost $20,000, Princess, for Salvation Army, Toronto. Architect, Major Miller, Salvation Army, Toronto. General contractor, W. H. Watts, Kingston. Two storeys, stone and brick construction.

Le Pas, Man.
Wireless station, cost $75,000. Builders and owners, Marconi Telegraph Co., 137 McGill St., Montreal. Station includes one 2 ft. tubular steel mast 250 ft. high, also 2 houses 8 rooms each and operating house, 25 x 35, concrete construction. To be operated by 20 h.p. engine and dynamo.

Lindsay, Ont.
Armoury for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa, Ont. General contractors, James Bogue, Lindsay.

Madoc, Ont.
Drill hall, cost $16,800. Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa, Ont. General contractor, L. E. Allen, Belleville, Ont. Stone foundation, brick construction, corrugated iron, felt and gravel roofing.

Maple Creek, Sask.
Drill hall, cost $27,313. Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractors, Navin Bros., Moose Jaw.

Montreal, Que.
Steel shed, cost $16,595, Lachine Canal, planned by Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Builders, Canadian Bridge Co., Ltd., Walkerville. Concrete foundation, corrugated iron or concrete construction.

Church, cost $12,843, Alma, for Italian Methodist Mission, c/o Rev. E. I. Hart, 164 Windsor St. Architects, Peden & McLaren, 20 St. Alexis St. General contractor, J. W. Gordon, 2211 Clarke St. Two storeys, 52 x 37, cement foundation, roughcast and Laprairie brick construction.

Convent, cost $100,000, for R. C. School Commissioners, Verdun. Architect, J. E. A. Benoit, 1198 Wellington St. General contractor, carpenter and painting, T. Sauve, 124 Church Ave. Mason, John Quinlan, 4412 St. Catherine W. Iron and steel, Phoenix Bridge Co., 83 Colborne. Brick, S. Marchessault, 8 Pacific St. Heating and plumbing, Berrier & Berrier, c/o General Contractor. Electrical, T. Desalliers & Fils, 1275 Wellington. Plastering, Jos. Ebien, 146 Lasalle Road.

Postal station "F," cost $57,000, Notre Dame and Richmond. Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Architect, D. J. Spence, 46 Beaver Hall Hill. General contractor, Jos. Bourque, Post Office, St. James St., or cor. St. Catherine E. and Maisonneuve. Two storeys and basement, 85 x 50.

Post office "L," cost $70,000, Westmount (Greene Ave). Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Architect, A. Piche, 52 Victoria Square. General contractors, John Quinlan & Company, 4412 St. Catherine W. Two storeys and basement, 102 x 85.

Newcastle, N.B.
Wireless station for Universal Radio Co. (The Poulson Syndicate). General contractors, Galbraith & Cate, Room 44, No. 179 St. James St., Montreal. Company purchased 57 acres. Seven towers will be erected, 50 h.p. engine required to drive dynamo.

Ottawa, Ont.
Church, cost $40,000, for Christian Scientists, Metcalfe St. Architect, J. P. MacLaren, 104 Sparks St. Carpenter, Alex. Christie, Elgin Street.

Orillia, Ont.
Sunday school, Peter street, for Presbyterian Church Congregation. General contractor, W. H. Bennett, wishes estimates on ash trimmings, maple and oak stairs and doors, hardwood floors.

Preston, Ont.
Post office, cost $44,861, Dom. Government, Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa, Ont. General contractor, Geo. E. Proctor, Sarnia, Ont.

Point Grey, B.C.
Four manual training schools, cost $4,000 each. Architect, J. H. Brown, Crown Building, Vancouver. General contractor, Alexander Grant, Eburne, received contract for buildings at Eburne, Kerrisdale and Shaughnessy Heights, at $3,230 each, Fred E. Gregory, Vancouver, was awarded the West Point Grey Bldg., at $3,165.

Radville, Sask.
Motion picture theatre, cost $6,000, planned by Odd Fellows Lodge. Architects and general contractors, Carlisle & Janousky. Two storeys, 50 x 80, frame, cement foundation, electric lighting, steam heating, motors and generators. Upper storey to be used as hall.

Renous, N.B.
Church, cost $25,000, for R. C. Congregation, c/o Rev. D. S. Murdock. General contractors, B. Mooney & Sons, 113 Queen St., St. John. Roofing and metal work, Jas. McDade, Mill St., St. John.

Regina, Sask.
Police station, cost $211,050, Osler St. Clerk, A. W. Pool. Architects, Clemesha & Portnall. General contractors, Parsons Construction Co., at $206,900. Heating and plumbing, The Regina Plumbing & Heating Co., at $4,150. Three storeys, and basement, terra cotta, stone and brick construction.

Sault Ste. Marie, Ont.
School, cost $25,000, Murray. Architects, Demar & Murdock. General contractors, A. C. McLeod & Son. Plumb-

ing, Stone & Walsworth. Two storeys, 48 x 80, solid brick construction, stone foundation.

Selkirk, Man.
Alterations and addition to hospital, cost $64,000. Prov. Govt. Dept. of Public Works. Acting Minister, G. Coldwell. Prov. Architect, V. W. Horwood, 261 Fort St., Winnipeg. General contractors, Carter-Halls & Aldinger Co., Ltd., 1010 Union Bank Bldg., Winnipeg.

Steelton, Ont.
Fire hall, cost $15,000, Wallace Terrace, for Town of Steelton and Lake Superior Corp. Architect and Engineer, W. B. Redfern, Steelton. General contractors, McIntyre, Haining & Kelly, Sault Ste. Marie. Two storeys, 76 x 35, structural steel and solid brick construction.

Toronto, Ont.
Postal station "G," cost $200,000, Queen and Saulter. Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa, Ont. Architect, E. J. Lennox, 164 Bay St., Toronto. General contractors, Witchall & Son, 163 Havelock St., Toronto.

Grand stand, cost $100,000, Queen E., for Ontario Jockey Club, Leader Lane. Architect, Geo. W. Gouinlock, Temple Bldg. General contractors, Wickett Bros., 35 Deer Park Cres. Steel, Hamilton Bridge Works, Hamilton. 50 x 400.

Toronto, Ont.
Church, cost $10,000, for Eglinton Baptists, Castlefield ave. Architect & builder, W. G. Renney, 100 Erskine ave. General contractor will sublet. One storey, 26 x 58, Roman stone and brick construction, brick foundation, galvanized iron, slate, felt and gravel roofing.

Weston, Ont.
Nurses' Home for National Sanitarium Association. Sec.-treas., R. Dunbar, 247 King St. W., Toronto. Architects, Denison & Stephenson, 20 King St. W., Toronto. Masonry and brick, Davidge & Lunn, 684 Bathurst St. Carpentry, F. J. Sproule, 34 Shanley. Steel, McGregor & McIntyre, 73 Pearl St. Galvanized iron and roofing, A. Matthews, Ltd., 256 Adelaide S. W. Plastering, Petrie & Co., 351 Dupont St. Painting, A. E. Bennett, 121½ Broadview ave.

Toronto, Ont.
College buildings, cost $500,000, Avenue Road, for Bishop Strachan School. Secretary, H. Jones, Lyndhurst avenue. Masonry, H. Page & Co., Queen's Park. Four storeys, steel, stone and brick construction, concrete and stone foundation.

Business Buildings and Industial Plants

Brantford, Ont.
Offices, cost $5,000, Wadsworth, for G. T. Ry. Co. Agent, R. Wright. Company's architect is preparing plans. Two storeys, 28 x 47, cement foundation, Logan block brick construction.

Calgary, Alta.
Ice plant, cost $200,000, planned. Crystal Ice Co., 417 Judge Travis Bldg., has purchased 11 lots on 11th ave. and 16th street west. Will manufacture artificial ice.

Packing industry and stock yard contemplated. Interested, City Council and President Negilus of the United Farmers of Alberta. Option taken on site of $360,000.

Galt, Ont.
Plant planned by B. F. Sturtevant Co., Hyde Park, Boston, Mass., who have purchased factory of Can. Motors Co. and will manufacture motors, dynamos, generators, dry kilns, ventilating fans, etc.

Lacombe, Alta.
Bank and offices, cost $25,000, Barnett ave., for Royal Bank. Two storeys, 40 x 56, red brick construction. Plans prepared.

London, Ont.
Storehouse, cost $5,000, planned for London Rolling Mills. Manager, J. White. Building to replace one destroyed by fire. One storey, fireproof construction and floors.

Medicine Hat, Alta.
Departmental store, cost $500,000, planned. The Hudson's Bay Company has purchased site 300 x 130, on Toronto St., on which they intend to erect store in 1914.

Moncton, N.B.
Biscuit factory contemplated for J. A. Marven Ltd., 514-526 Main St. 60 x 260. Plans will be prepared.

Stores, cost $4,500, St. George, for Murdock McLeod, Church St. Masonry, O. J. Dunham, 50 Brydges. Tenders being called by architect, W. C. Barnes, Wyse Bldg., for carpentry. Two storeys, 20 x 60, brick construction. Foundations in.

Montreal, Que.
Wholesale grocery and warehouse, cost $45,000, near 1170 St. Lawrence Blvd., for P. Adelstein, 1173 St. Lawrence Blvd. General contractors, concrete and brick and carpentry, Gilbert Demers & Satrazin, 861 St. Lawrence. Tenders received by general contractor for other trades. Four storeys and basement, 33 x 70, concrete foundation, stone and solid brick construction.

Hotel, cost $40,000, Laurier ave. Tenders received by architect, W. E. Doran, 189 Bleury, from July 28th to August 5th. Three storeys and basement, 35 x 70, concrete foundation, Montreal stone and brick construction. Owner's name withheld.

Factory contemplated for Wilson Carbon Paper Co., Ltd., 335 Lagauchetiere W. Plans not yet decided upon.

Addition to store and ice cream parlor, cost $15,000, 322 St. Catherine W., for Geo. Nicholas & Co., 322 St. Catherine St. W. Tenders received by architect, D. J. Crighton, Jacobs Bldg., until July 30. Three storeys, 30 ft., cement foundation, structural steel and brick construction.

Ottawa, Ont.
Business block, cost $145,000, for American Bank Note Co., Wellington St. Architect, J. Albert Ewart, 193 Sparks street. Carpentry, J. & C. Low, 262 Catherine. Foundations in.

Orillia, Ont.
Factory planned for C. N. W. Shoe Co., London, Ont. Ratepayers passed bylaw to loan $25,000 for 20 years, no interest, free site and fixed assessment. Work on building to commence at once.

Princeton, B.C.
Lodge and office bldg., cost $10,000, for I. O. O. F. Architects, McLean & Russell. Two storeys, 50 x 100, brick veneer construction, stone foundation. Tenders received by architects till August 1st.

Toronto, Ont.
Garage, cost $180,000, University Ave., for G. H. Gooderham, 49 Wellington St. E. Architect, E. J. Lennox, 164 Bay St. Stone, steel and brick construction. Plans ready.

Sporting goods factory, Albany, for Harold A. Wilson & Co., 299 Yonge St. Architects, Chapman & McGiffin, 95 King E. 55 x 175. Plans prepared.

Offices (freight), cost $250,000, Simcoe St., for C. P. R., King and Yonge. Architects, Hutchison, Wood & Miller, 50 Royal Insurance Bldg., Montreal. 7-storeys, 50 x 140, structural steel, reinforced concrete and brick construction, cement foundation. Plans drawn.

Stores and apartments, cost $15,000, Carlton, for Robert Davies, 36 Toronto St. Tenders received by architect, H. Simpson, 82 King St. E. Three storeys, 50 x 60, steel, brick and stone construction, stone and brick foundation.

Trenton, Ont.
Store, cost $15,000, for S. B. McClung & Co. Architect, Geo. Kelly. Two stys., 33 x 150, pressed brick, structural steel and iron construction.

Winnipeg, Man.
Publishing plant, cost $173,000, Smith St., for Tribune Publishing Co., 211 McDermot ave. Architect, John D. Atchison, Trust & Loan Bldg. General contractors, Hazelton & Walin, 303 Donalda Bldg. Permit has been issued to increase height of new 3-storey building to six storeys.

Laundry, cost $30,000, for St. Boniface Hospital Board. Architect, J. A. Hudon, 7th floor Builders Exchange Bldg. General contractors, J. H. Tremblay Co., Ltd., 814 Sterling Bank Bldg. Steel, Vulcan Iron Works, Point Douglas avenue. Roofing, Winnipeg Ceiling & Roofing Co. Electrical work, Shipman Electric Company, 396 Portage avenue. Two storeys and basement, 100 x 33.

Dominion Trusts Co., Ltd., 402 Pender St. W., Vancouver and Main streets, Winnipeg, contemplate erecting 16-storey office building on site of their present building on Main street. Work will not go on this year.

CONTRACTS AWARDED

Calgary, Alta.
Addition to malt house for Canadian Malting Co. General contractors, Canadian Stewart Co., 901 Eastern Townships Bank Bldg., Montreal. It is also contemplated to extend the elevator accommodation.

Garage, cost $6,000, Sixth Ave., for Alberta Government, Fourth St. W. Architect, Mr. Blakey, Public Works Department. Superintendent, M. Calder, Public Works Dept. Work being done by day labor. One storey, 32 x 74, sand stone construction, cement foundation.

Warehouse, 10th ave. west, for the Consolidated Rubber Co. General contractors, Canadian Stewart Co., 901 Eastern Townships Bank Bldg., Montreal.

Eburne, B.C.
Garage, cost $18,000, for D. S. McLaghlan. Architect, F. J. Peters, 837

(Continued from page 72)

Tenders and For Sale Department

Sealed tenders addressed to the undersigned and endorsed "Tender for Toronto Harbour Works," will be received at this office until 4 p.m. on **Monday, August 25, 1913**, for the construction of a Sea Wall, Breakwater, Ship Channel and Retaining Walls at the City of Toronto, in the County of York, Province of Ontario.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department and at the offices of J. G. Sing, Dist. Engineer, Confederation Life Bldg., Toronto, Ont.; Harbour Commissioner's Office, 76 Adelaide St. West, Toronto; H. J. Lamb, Esq., District Engineer, Windsor, Ont., and J. L. Michaud, Esq., District Engineer, Post Office, Montreal, Que.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to five per cent. (5 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, July 12, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—44297 F

Sealed tenders addressed to the undersigned and endorsed "Tender for Public Building, Sudbury, Ont.," will be received at this office until 4 p.m., on **Wednesday, August 6, 1913**, for the work mentioned.

Plans, specifications and forms of contract can be seen and forms of tender obtained at the office of Mr. Thos. Hastings, Clerk of Works, Postal Station "F," Yonge Street, Toronto, at the Post Office, Sudbury, Ont., and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to five per cent. (5 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, July 16, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—45139. 31

DERRICKS FOR SALE

One 25-ton Terry & Tench travelling stiff leg derrick.

One 20-ton stiff leg derrick.

One 15-ton stiff leg derrick.

No reasonable offer refused.

National Sand & Material Company, Ltd.
30-31-32 Welland, Ont.

Tenders for the Construction of Sewers

Sealed tenders will be received by Mr. C. M. Webber, Town Clerk, Welland, Ontario, up to 5 p.m. on **Monday, August 4th, 1913**, for the construction of Separate Sewers on the following streets:

Maple Avenue, William Street, Oakland Avenue, Asher Street, River Road, Duncan Street, Cady Street, John Street.

Specifications and tender forms may be had at Engineer's Office, Welland. Plans and specifications may also be seen at office of Contract Record and Engineering Review, 220 King St. West, Toronto, on or after the 25th inst.

A marked cheque for 10 per cent. of the amount of the tender must accompany each tender or an acceptable bidder's bond of same value will be accepted.

The lowest or any tender not necessarily accepted.

The tenders may be awarded separate or in bulk.

JAMES HUGHES,
Chairman Sewerage Committee.
Welland, July 22nd, 1913. 31

Sealed tenders, addressed to the undersigned, and endorsed "Tender for Wharf at Vancouver, B.C.," will be received at this office until 4 p.m., on **Thursday, August 21, 1913**, for the construction of a Wharf at Vancouver, B.C.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department and at the offices of C. C. Worsfold, Esq., District Engineer, New Westminster, B.C.; J. S. MacLachlan, Esq., District Engineer, Victoria, B.C., The District Engineer's Office, Confederation Life Building, Toronto, Ont.; J. L. Michaud, Esq., District Engineer, Post Office Building, Montreal, Que., and on application to the Postmaster at Vancouver, B.C.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and places of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to five per cent. (5 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, July 8, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—44661.

F

For Sale

FOR SALE.—Three Second-Hand Contractor's Dinky Vulcan Locomotives in first-rate condition. One 9-in. x 14-in. and two 10-in. x 16-in. Also a 50-ton Steam Shovel, and some contractors' Dump Cars. Apply to The Canadian Fairbanks-Morse Co., Ltd., 444 St. James Street, Montreal. 30-31

TENDERS

Will be received by the undersigned up to **Friday, August 15th, 1913**, for the erection of a three storey concrete and brick Municipal building for the Town of Cobalt, approximately 43 ft. x 100 ft., according to plans and specifications prepared by Messrs. Angus & Angus, Architects, North Bay.

Contractors are required to enclose a marked cheque along with each tender for five per cent. of the amount of same, the lowest or any tender not being necessarily accepted.

Work to commence immediately on award of contract.

Plans and specifications may be seen at the office of the architect or at the office of the undersigned.

R. L. O'GORMAN,
Town Clerk,
30-31 Cobalt, Ont.

BRIGHTON, ONTARIO

NOTICE

Whole or separate tenders will be received up to noon of **Monday, July 28th**, for the erection of a factory building. Plans and specifications for which may be seen at the office of the architect, W. A. Mahoney, O. A. A., Guelph, or at the office of Geo. Drewery, B.A., Barrister.

Lowest or any tender not necessarily accepted.

(Signed) GEO. DREWERY, B.A.,
Barrister,
30-31 Brighton, Ontario.

Special Notice

Every man who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works are advertised.

Send along your plans when asking for tenders put a line in your advertisement to that effect.

No extra charge is made for filing plans at one or all four offices.

Contract Record and Engineering Review

Montreal—119 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—429 Pender Street.

Notice to Contractors

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on

Tuesday, 19th August, 1913

for the construction of the following works:—

Midway Sewer System

Outlet via Hiawatha Ave., Gerrard St. and Morley Avenue

Division No. 2, West Toronto

Woodville Avenue

Balsam Avenue, Queen Street to Kingston Rd.

East Toronto, Section A, Outlet

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications may be seen and forms of tender obtained at the office of the Commissioner of Works, Toronto.

The tenderers shall submit with their tender, the names of two sureties (approved of by the City Treasurer, not members of the City Council or officers of the Corporation of the City of Toronto) or in lieu of said sureties, the bond of a guarantee company approved of as aforesaid.

The usual conditions relating to tendering as prescribed by City By-law must be strictly complied with.

The lowest or any tender not necessarily accepted.

H. C. HOCKEN, Mayor,
Chairman, Board of Control.
Toronto, July 24th, 1913. 31

Tenders for Dredging

Sealed tenders, addressed to the undersigned, and endorsed "Tender for Dredging, Rainy River, Ontario," will be received until 4.00 p.m., on **Tuesday, August 12, 1913**, for dredging required at Rainy River, Ontario.

Tenders will not be considered unless made on the forms supplied, and signed with the actual signatures of the tenderers.

Combined specification and form of tender can be obtained on application to the Secretary, Department of Public Works, Ottawa. Tenders must include the towing of the plant to and from the work. Dredges and tugs not owned and registered in Canada shall not be employed in the performance of the work contracted for. Contractors must be ready to begin work within thirty days after the date they have been notified of the acceptance of their tender.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, for five per cent., (5 per cent.) of the contract price, no cheque to be for less than fifteen hundred dollars, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, July 26, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—45359. 31

Tenders Wanted

Sealed tenders will be received by M. D. Hallman, Esq., Court House, Berlin, up to 3 p.m., on **Friday, August 8**, for the construction of the following for the County of Waterloo.

1. 35 ft. concrete arch at Hawkesville.
2. Retaining wall at New Hamburg.
3. Extra steel joints on concrete floor for the 120 ft. x 18 ft. New Hamburg bridge.

For plans and specifications and other information apply to

S. CASSEL, Esq.,
New Hamburg.
J. G. HURST Esq.,
Connestogo.

BOWMAN & CONNOR,
Engineers,
31 Toronto and Berlin.

Tenders for Dredging

Sealed tenders, addressed to the undersigned, and endorsed "Tender for Dredging, Little Current," will be received until 4.00 p.m., on **Tuesday, August 12 ,1913**, for dredging required at Little Current, Ontario.

Tenders will not be considered unless made on the forms supplied, and signed with the actual signatures of the tenderers.

Combined specification and form of tender can be obtained on application to the Secretary, Department of Public Works, Ottawa. Tenders must include the towing of the plant to and from the work. Dredges and tugs not owned and registered in Canada shall not be employed in the performance of the work contracted for. Contractors must be ready to begin work within thirty days after the date they have been notified of the acceptance of their tender.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, for five per cent. (5 per cent.) of the contract price, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, July 26, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—45519. 31-32

Some Good Machines

Buckeye Trenching Machine, 12 in. x 4½ ft, A1 ... ... $700

Buckeye Trenching Machine, 27 in. x 8 ft.; just through shops; as good as new $2,500

Parsons Trenching Machine, 2 ft. x 5 ft. to 20 ft. deep. A1 ... ... $3,500

Thew No. 0 Steam Shovel. Overhauled by Thew Manufacturers last year. A1 ... ... $2,800

TRACTION ENGINE

Located in Canada, 30 H.P.

undermounted, double Avery machine, coal burner with rear mounted Steel Water Tank. Also an Avery Steel Water Tank on truck **with pump.** Cost, new, $3,575. This is in first-class condition $1,800

WHAT DO YOU NEED IN SECOND-HAND EQUIPMENT?

TRY US!

WILLIS SHAW MACHINERY CO.

La Salle Street, Chicago. Ill.

For Sale

One Koehring Concrete Paving Mixer, capacity 14 cu. ft.

One Austin Cube Concrete Paving Mixer, capacity 9 cu. ft.

One 20 h.p. Case Traction Engine.

All of above used only a few months and in perfect condition.

Apply Box 831, Contract Record, Toronto, Ont. 29-t.f.

Business Buildings and Industial Plants

Hastings St. W., Vancouver. General contractor, C. H. Taylor, Carter-Cotton Bldg., Vancouver. 1½ storeys, concrete foundation, mill and roughcast construc.

Edmonton, Alta.

Warehouse, cost $55,000, 3rd ave., for A. MacDonald Co., Ltd., 2nd street. Architect, W. A. Irish, 219 Kennedy Bldg., Winnipeg. General contractor, A. J. Gillis, Chisholm Block. Four storeys, 56 x 150, stone and brick construction, cement foundation.

Hamilton, Ont.

Alterations and addition to store, cost $15,000, James St. N., for M. & S. Epstein, Dom. House Furnishing Co., 120 James St. N. Architect, W. A. Edwards, 7 Hughson St. S. General contractor, Geo. E. Mills, King St. E. Three stys., 70 x 100.

Warehouse, cost $16,000, Park St. S., for Geo. H. Rillett, 830 Main St. E. Architect, A. W. Peene, Clyde Block. General contractor, Geo. F. Webb, Wentworth St. S.

Kingston, Ont.

Factory, cost $20,000, for Kingston Floor & Wall Tile Co. General contractor, Wm. McCartney, Earl St. One sty., 300 x 100, brick construction, concrete foundation. Foundations in.

London, Ont.

Biscuit factory, cost $260,000, East, for McCormick Mfg. Co., Wellingston and Dundas streets. Manager, Geo. McCormick. Architects, Watt & Blackwell, Bank of Toronto Chambers. General contractors, Can. Frost & Winchester Co., Ltd., 5 Curry Hall, Windsor. Contract for steam plant, including engines, boilers, etc., awarded to Messrs. Leonard & Sons. Contract for generators and electrical equipment awarded to Canadian Westinghouse Co., Ltd., Hamilton, Ont. Belting, piping, etc., to be purchased later.

Medicine Hat, Alta.

Warehouse, cost $25,000, (N. Railway), for Dominion Grocery Co. Architect and general contractor, Lussier Construction Co., Toronto St. Two storeys, 40 x 90, red brick construction. Foundations in.

Stores, cost $8,000, for Herbert Baker, City Clerk. Architects, Bourne & Morrison, Huckvale Block. General contractors, Crossley Bros. Two storeys, 25 x 80, red brick construction, felt and gravel roofing.

Montreal, Que.

Alterations to Place Viger Hotel. C. P. R., Windsor St. Architects, C. P. R. Engineering Dept., Windsor St., c/o Mr. Videtto. General contractors, Canadian Stewart Co., 901 E. T. Bank.

Bank, cost $50,000, Papineau and Mt.

Royal, for Royal Bank of Canada, 147 St. James St. Architect, K. G. Rea, 54a Beaver Hall Hill. General contractors, masonry and carpentry, Purdy & Henderson, New Birks Bldg. Plastering, McNulty Bros., 182 Mountain. Roofing, heating and plastering, Hickey & Aubut, 93 Dominion. Painting, Alex. Craig, 41 Jurors. Electrical work, Electrical Repair & Contracting Co., 119 Lagauchetiere W. Marble, Mariotti Marble Co., 269 Ottawa. Two storeys, 60 x 50, granite construction.

Orillia, Ont.

Stores, cost $5,000, Mississaga St., for Geo. Vick & Sons. Work done by day labor, under supervision of Mr. W. H. Bennett. Two storeys, 36 x 50, brick construction, steam heating, steel beams, 8 radiators required. Foundations in.

Quebec, Que.

Warehouse, cost $5,000, for J. Arthur Turcotte, St. Paul St. Architect, general contractor, mason and carpenter, Jos. Chevalier. Iron and steel, Eastern Canada Steel & Iron Works, Ltd., St. Malo. Roofing, S. Falardeau. Four storeys, 27 x 54, stone foundation, structural steel and Scotch brick construction.

Toronto, Ont.

Storage shed, cost $9,000, Dufferin, for Dom. Radiator Co., Dufferin St. General contractors, Brown & Cooper, 297 Carlton St. All contracts but carpentry to be sublet. One storey, 136 x 182, structural steel and frame construction, cement foundation.

Warehouse, 405 King W., for Warwick Bros. & Rutter, 401 King W. Architects, Steele & Sons, Stair Bldg. General contractors, Harris & Harris, Confederation Life Bldg. Carpentry, R. G. Kirby, 539 Yonge St. Steel, McGregor & McIntyre, Pearl St. Roofing, W. E. Dillon Co., 78 Richmond E. Painting, Geo. H. Shackleton, 43 Collier. Four storeys, 100 x 50. Plumbing, J. H. Warwick, 226 Wellesley street. Ornamental iron, Shipway I. B. & Mfg. Co., 773 King W.

Alterations to bank building, cost $3,000, Dovercourt, for Standard Bank, 9 Front E. Architects and builders, Baldwin & Woods, 9 Front St. E. Two stys., 16 x 25, structural steel and Indiana stone construction, cement and stone foundation. Plans drawn.

Factory, 570 King W., for Can. Rogers & Co., 570 King W. Architect, company's engineer. General contractors, owners. Engineers will supervise construction. Work to start shortly. Steel and brick construction, stone foundation.

Vancouver, B.C.

Garage, cost $30,000, Seymour street, for Wm. Frederick Gardiner, 347 Pender St. General contractors, Dominion Construction Co., 509 Richards St. Three storeys, 50 x 120, concrete and pressed brick construction.

Wadena, Sask.

Hotel, cost $26,000, for Ike Diner, Yorkton, Sask. Architect, Max Blankstein, 450 Dufferin ave. General contractors, Alex. Black Lumber Co. Three storeys, 46 x 72.

Winnipeg, Man.

Store and office, cost $20,000, for W. Zimmerman, 669 Main St. Architect, Max Blankstein, 450 Dufferin ave. General contractor, G. Martin, 80 Dubus St., Norwood. Two storeys, 18 ft. 4 in. x 85 ft., stone foundation.

Woodstock, N.B.

Warehouse, for Geo. E. Barbour Co., Ltd., North Market Wharf, St. John. Architect, F. Neil Brodie, 42 Princess St., St. John. General contractor, Fred Ryan, Fredericton. 1½ storeys, 40 x 80, cement brick foundation, pressed brick construction.

Residences

Calgary, Alta.

Residence, cost $5,000, Bankview. Architect and owner, Thos. Beggs, 2524 16 B St. W. Two storeys, 36 x 50, frame construction, cement foundation. Plans ready.

Medicine Hat, Alta.

Residence, cost $6,000, Toronto Street, for T. E. McPailon. Architects, Bourne & Morrison, Huckvale Block. 2½ stys., 80 x 39, frame, cement foundation. Plans ready.

Manse, cost $9,500, Esplanade, for Presbyterian Church. Pastor, W. Morrow. Architects, Bourne & Morrison, Huckvale Block. 2½ storeys, 35 x 35, red brick, artificial stone and roughcast construction, brick foundation. Plans drawn.

Flats, cost $7,000, Guy, for Montreal Quilting Co., 156 Guy. Tenders received by architect, Robert Findlay, 10 Phillips Place. Three storeys, 156 x 49, cement foundation, brick construction.

Montreal, Que.

Flats, cost $5,200, for Mr. Courvillon, Wellington St., Verdun. Architect, L. W. Julien, 270-2 Ethel St. Three stys., 25 x 48, brick construction, cement foundation. Plans drawn.

Apartment house, cost $1,000,000, Dorchester, for Montreal Apartments Ltd., 15 St. James St. Architect, R. Charbonneau, 15 St. James St. Tenders will be called about July 28th. Ten storeys, 168 x 124, stone and cement foundation, stone trimmings.

St. Paul's Island, N.S.

Tenders received by Minister, Alex. Johnston, Dom. Govt. Dept. of Marine & Fisheries, Ottawa, until August 12th noon for construction of double wooden dwelling for superintendent and staff at St. Paul's Island, N.S. Plans and specifications at agency of Dept., Halifax, Post offices at Sydney, North Sydney, Baddeck and Glace Bay, N.S., and at Department, Ottawa.

Toronto, Ont.

Five pair residences, cost $20,000, Castmount ave., for Consolidated Building & Supply Co., Temple Bldg. Manager, H. J. Rea. Tenders received by owners for all trades. Two storeys, brick and stone construction, stone foundation.

Apartment house, cost $7,000, Laburnam ave. Tenders received by architect, J. A. Thatcher, 31 Queen W. Three storeys, 40 x 50, brick and stone constr., stone foundation.

Residence, cost $10,000, Yonge Street, for J. McNab Anderson, care architect, J. M. Jeffreys, 708 C. P. R. Bldg. 2½ storeys, 32 x 40, brick construction, stone foundation. Plans drawn.

Residence, cost $6,000, Wells Hill, for R. Mowbray, 6 Howard St. Architect, J. H. Stanford, Bloor and Ossington. 2½ storeys, 33 x 34, brick construction and foundation. Plans ready.

Windsor, Ont.

Bachelor apartments, cost $18,000, Ferry St. Architects, Leybourne & Whitney. Three storeys and basement, 34 x 50. Brick construction and foundation. Plans in progress.

CONTRACTS AWARDED

Edmonton, Alta.

Rooming house, cost $20,000. Owner and general contractor, Jno. Johnson, 50 Stewart St. Architects, Hardie & Markland, 16 Victoria Block. Three storeys, frame construction. Foundations in.

Medicine Hat, Alta.

Apartment house, cost $22,000, 6th and

Cap. 75000 gals. Height 85-ft.
Canadian Car and Foundry Co., Montreal

Canadian Plant
Chicago Bridge & Iron Works
BRIDGEBURG - ONTARIO

Our Specialty is the Design, Manufacture and Erection of ELEVATED STEEL TANKS for Municipal, Railroad and Factory Service.

We also design, manufacture and construct Oil Tanks, Coaling Stations, Bridges, Turntables, Buildings and Structural Material.

WRITE TO-DAY FOR CANADIAN ILLUSTRATED CATALOGUE NO. 15

OFFICES BRIDGEBURG, ONT., CANADA
Chicago, Ill. U.S.A.
New York, N.Y., U.S.A.
Dallas, Texas, U.S.A.
Greenville, Pa., U.S.A.

SHOPS—BRIDGEBURG, ONT., CAN.
Chicago, Ill., U.S.A.
Greenville, Penn., U.S.A.

Grand Trunk Pacific Ry.
Lines West of Winnipeg

How Much is Your Power Loss Annually?

In the big Canadian plants where ***efficiency*** methods are being effectively employed to ***check*** leakages, this is the question that is being given the most ***serious*** consideration.

Because it has been found that such losses—which in many instances reach ***astounding*** figures—are due, mainly, to ***indifference*** and lack of ***care*** in the selection of suitable belting.

Your Loss or Your Gain Depends Upon Your Belting

That is what gives importance to this—our message to you.

For ***forty*** years, we have been producing Rubber Beltings that have become the ***standards*** by which other beltings must be judged.

We have studied the power transmission question from every angle and brought to bear upon it the experience, brains and skill of our ***experts***—familiar with actual working conditions—and the resources of ***largest*** and ***best*** equipped plant in Canada.

And we have produced four grades of Power Belting that are 100% efficient in ***Reliability*** and ***Service*** in Power Transmission.

"PARA" "KEEWATIN" "LUMBER KING" "COLUMBIA"

These are the beltings used wherever ***efficiency*** is the first consideration—wherever Beltings are bought on their ***merit***.

Every step in their manufacture is governed by the ***prudence*** and ***experience*** of a lifetime—plus the ***unwavering*** determination to produce beltings that would measure up to every ***Service*** test.

If You Are Not Getting the Service You Expected From the Beltings You Buy, Get in Touch With Us. We Can Help You — And We Know How.

WRITE OUR NEAREST BRANCH TO-DAY.

We are Specialists in Beltings For Every Purpose.

Canadian Consolidated Rubber Co., Limited

Montreal

SALES BRANCHES:

Halifax, ST. JOHN, Quebec, MONTREAL, Ottawa, TORONTO, Hamilton, London, Berlin, Brantford, North Bay,
WINNIPEG, Regina, Saskatoon, Edmonton, Calgary, VANCOUVER, Victoria

Fewings St., for Wm. Steinecke, Cecil Hotel. Architects and builders, Harrison & Ponton, Huckvale Block. Three storeys, 36 x 96, red brick construction, cement foundation.

Montreal, Que.

Apartment house, cost $40,000, Lorne Crescent. Owners and general contractors, Hand & Pick, 609 Belmont avenue, Westmount. Builder, D. J. Crighton, Jacobs Bldg. Five storeys, 59 x 71, concrete foundation, reinforced concrete, terra cotta and brick construction.

Toronto, Ont.

Three detached apartments, cost $15,000, Ossington, for W. S. Grimshaw, 1990 Davenport Rd. Architect, N. G. Beggs, 12 Cosgrave Bldg. Work to be done by day labor. Will start at once. Owner buys all material. Plumbing will be sublet. Three storeys, 33 x 67, brick construction, stone foundation.

Power Plants, Electricity and Telephones

Ayr, Ont.

Ratepayers passed by-law to use Hydro Electric power. The neighboring villages of Princeton, Drumbo and Plattsville also voted favorably. Clerk, A. J. Reid.

Brantford, Ont.

Hydro Electric system planned for Municipal Council of Grand View. Further information from David Tattersoll or Edward Cowler, Grand View.

Brockville, Ont.

Conduit and wire, Perth street, for Brockville Light & Power Dept. Manager, E. J. Philip. Will require large quantities of underground conduit, cable, etc., all electric service wires, etc., are to be put underground before laying of new pavement. Further information from manager.

Calgary, Alta.

Power sub-station, Crescent Heights, planned by City Council. Clerk, J. M. Miller. Engineer, Geo. Craig. General contractors, Bennett & Debnam, 5 Thomas Block. Two storeys, 50 x 80, brick and reinforced concrete construction, cement foundation.

Halifax, N.S.

Halifax Power Company intend developing two sites on Indian River to supply power for industrial and lighting purposes in Halifax. Each site will include two units of 1,200 kv.a. each. Power to be carried over duplicate transmission lines.

Ingersoll, Ont.

Electric lighting equipment planned by Town Council. Clerk, W. A. Smith. Cluster lights and other improvements contemplated.

Kingston, Ont.

Conduits planned by City Council. Overhead wires are to be put underground. Full information from C. C. Folger, General Manager Civic Utilities.

London, Ont.

Machinery for McClary Mfg. Co. Messrs. E. Leonard & Sons, awarded contract for new engines in connection with power plant for factory.

McKillop Twp., Ont.

Extension, telephone system, cost $2,400, for Township Council. Clerk, M. Murdie, Winthrop, Ont.

New Hamburg, Ont.

Electric lighting. Ratepayers passed by-law to give Electric Light Co., Mill St., a 10-year contract and a 30-year franchise. Manager Byron Heaslip.

Ottawa, Ont.

Exchange Bldg., cost $45,000, First ave. for Bell Telephone Co. Architect, J. Albert Ewart, 193 Sparks St. General contractor, Geo. Crain, Clemow ave. Plastering, Frank Hunt, 115 Arlington. Painting, P. Stewart, Bank St. Heating and plumbing, Holloway & Son, 373 Somerset.

River Glade, N.B.

Power house for Jordon Sanitarium Commissioners. Dr. Townsend, River Glade. Architect, F. Neil Brodie, 42 Princess, St. John. General contractor, R. A. Corbett, Douglas ave., St. John.

Toronto, Ont.

Electrical plant, cost $250,000, planned for Hot Point Electric Heating Co. President, Willis Booth, Los Angeles, California. Company expect to build branch plant employing about 150 hands.

Watford, Ont.

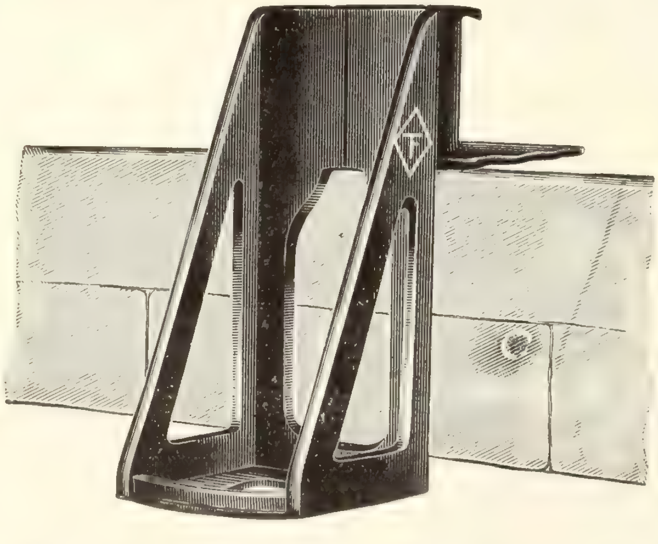
Hydro electric lighting planned by Town Council. Clerk, W. S. Fuller. By-law has been voted on.

Yorkton, Sask.

Telephone Exchange, cost $15,000. Plans, specifications, etc., at office of Department. Tenders received by Minister, Hon. J. A. Calder, Regina. Provincial Govt., Dept. of Railways, Telephones & Telegraphs.

Large Stock of Wall and Beam

Hangers



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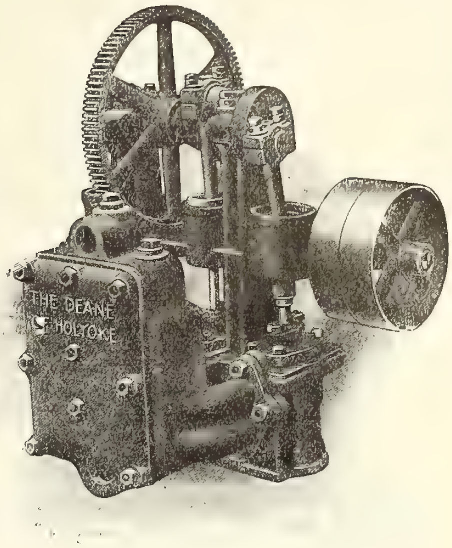

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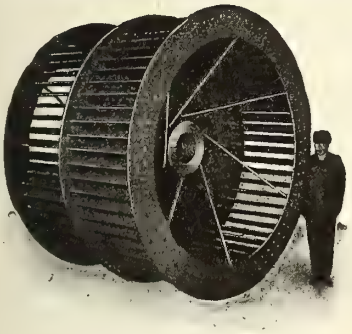

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Low cost of Installation, low cost of Operation, low cost of Maintenance, and High Efficiency are the deciding features of "Sirocco."

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A "Sirocco" Fan will deliver more air with less power than the ordinary steel plate fan twice the size.
"Sirocco" Fans and Blowers are used in connection with apparatus for Heating, Ventilating and Cooling, in Industrial, Educational, Office and Public Buildings.
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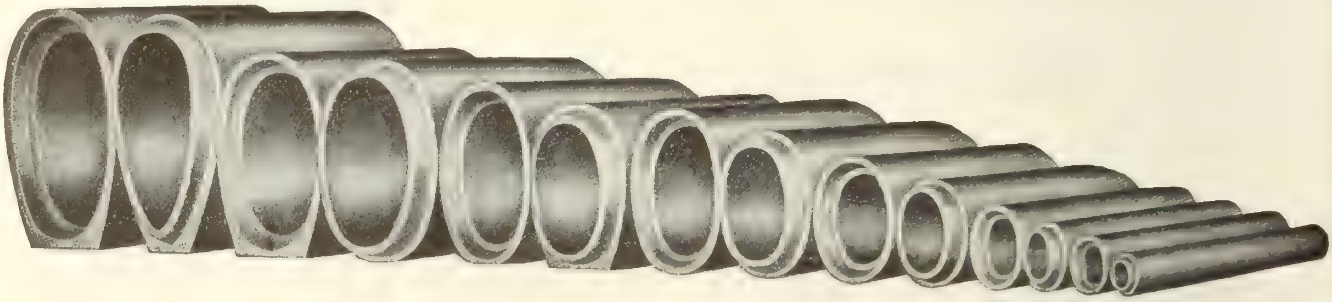

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with one of our "Majestic" Coal Chutes which is the neatest and best equipment for any cellar. It is easily installed in either new or old houses. It permits coal, wood or vegetables to be put into the cellar without disfiguring the building in any way. And unlike a glass window it cannot be broken. The hopper can easily be removed if desired to put in very coarse coal or wood, or if a waggon chute is used. It swings back into the chute and allows the door to be closed. The door is made to lock when opened upward, and protects the wall or siding above the chute, and can be released only when closed. We make three standard sizes. There's a size that's just right for your cellar and your requirements. No. 1—22 x 16 x 13. No. 2—27 x 16 x 13. No. 3—33 x 22 x 18.

Send for our illustrated booklet, it shows and describes our full line of Coal Chutes

The Galt Stove & Furnace Co., Limited, GALT, ONT., CAN.

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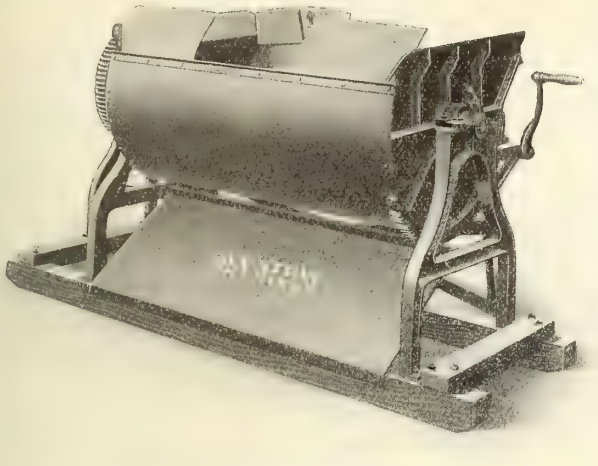
Time Saved in Concrete Mixing



The Blystone Skid Mixer

Every movement of this mixer is calculated to save time. The mixing is quick and thorough and the dumping, worked by the handle on the right will save moments at every batch turned out. Strongly built—all working parts carefully balanced.

The Blystone Machinery Company
61 Railroad St., CAMBRIDGE SPRINGS, Pa., U.S.A.

Full line of Blystone Mixers carried in stock by
The A. R. WILLIAMS MACHINERY COMPANY, Limited
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Corrugated Iron

"Metallic" is the only corrugated iron that actually has deep corrugations. We make our corrugated iron from sheets of especially made metal that holds its shape, and the corrugations remain straight and true indefinitely. Ask us to send you all the facts about our corrugated iron. Metal experts —men who know—specify "Metallic" when ordering corrugated iron. Let us tell you why. We can supply you with either galvanized or painted sheets, flat or curved.

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Contractors' Acetylene Flare Lights

Made in Two Sizes

SIZE NO 1—

8,000 Candle Power, operates 12 Hours on 18 lbs. Carbide.

Price F.O.B. Ottawa $95.00.

SIZE NO. 2—

1,000 Candle Power, operates 12 Hours on 8 lbs. Carbide.

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Manufactured by

International Marine Signal Co. Limited
Ottawa, Canada

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1—D.D. Electric Hoist.
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5—Rock Drills.
Irons for two travelling 10 ton Derricks.
40—36 Gauge 4 Yard Dump Cars.
1—6x9 Sand Pump, Steam Connected.
1—50 H.P. Tubular Boiler.
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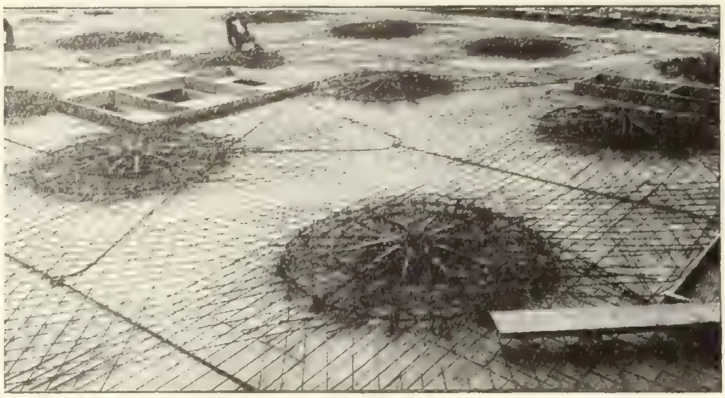
2—6x3 3/4x6 Duplex Pumps.
2—5 1/4x4 3/4x5 Duplex Pumps.
1—No. 5 Rumsey Hydraulic Ram.
1—No. 2 Milwaukee Concrete Mixer, (New.)
1—Set Irons and Buckets for No. 5 Austin Stone Elevator.
1—No. 4 Champion Stone Crusher.
1—No. 10 Western Stone Crusher.

The above machines are but slightly used and are in good working order.

Fleming Machinery Company
840 Sparks Street, Ottawa, Can.

View of Reinforcing steel in place.



Get Maximum Efficiency From Your Concrete Reinforcing

When the concrete is compressed in several directions, the compression in one direction tends to off-sett that in another. This fact permits the use of a minimum amount of concrete with high efficiency in the steel in the mushroom system

The multiple way reinforcing more than doubles the crushing strength of the concrete

MUSHROOM SYSTEM Reinforced Concrete

A system that assures ECONOMY and RAPIDITY of construction together with DURABILITY and LOW MAINTENANCE.

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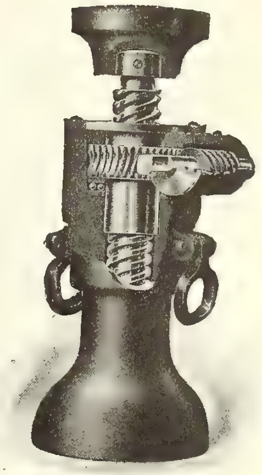
"ATLAS" BALL BEARING JACKS

Reference to the sectional view shows a simple and sturdy construction, and yet the Atlas is in reality a jack of precision. It can be elevated to one-thousandth part of an inch **and remain elevated with the load for any length of time.** You can always depend on it.



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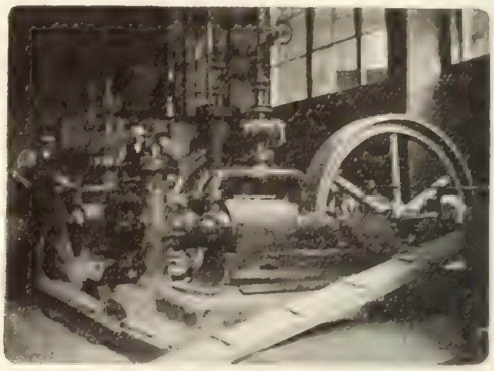

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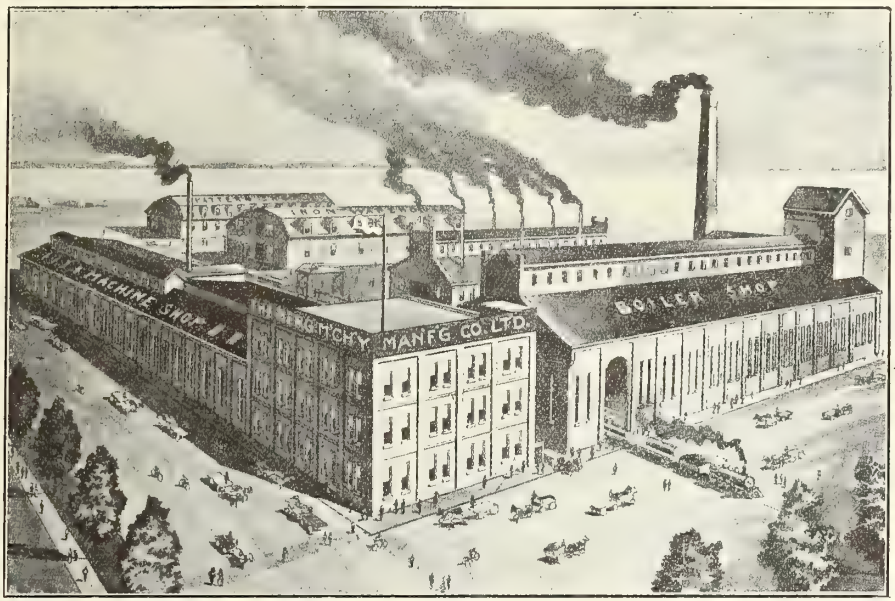

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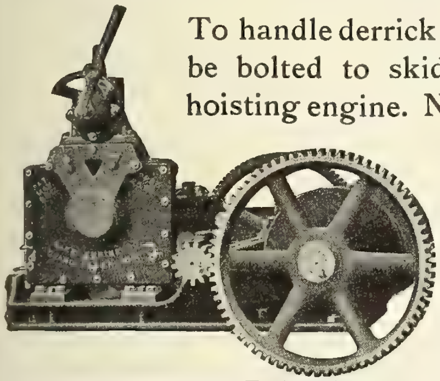

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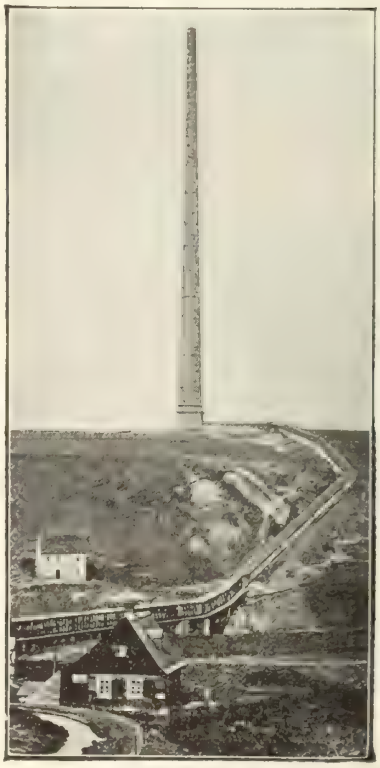

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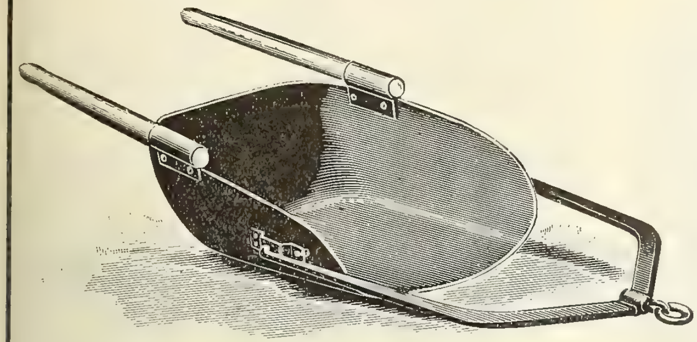

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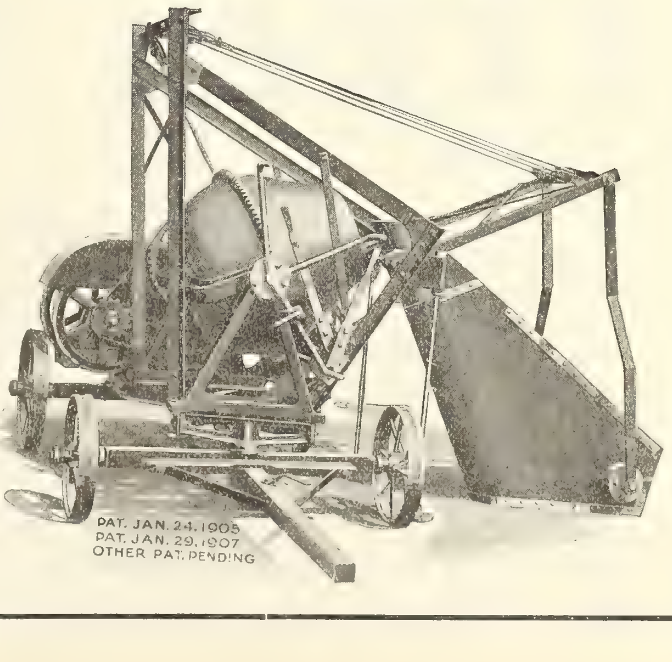
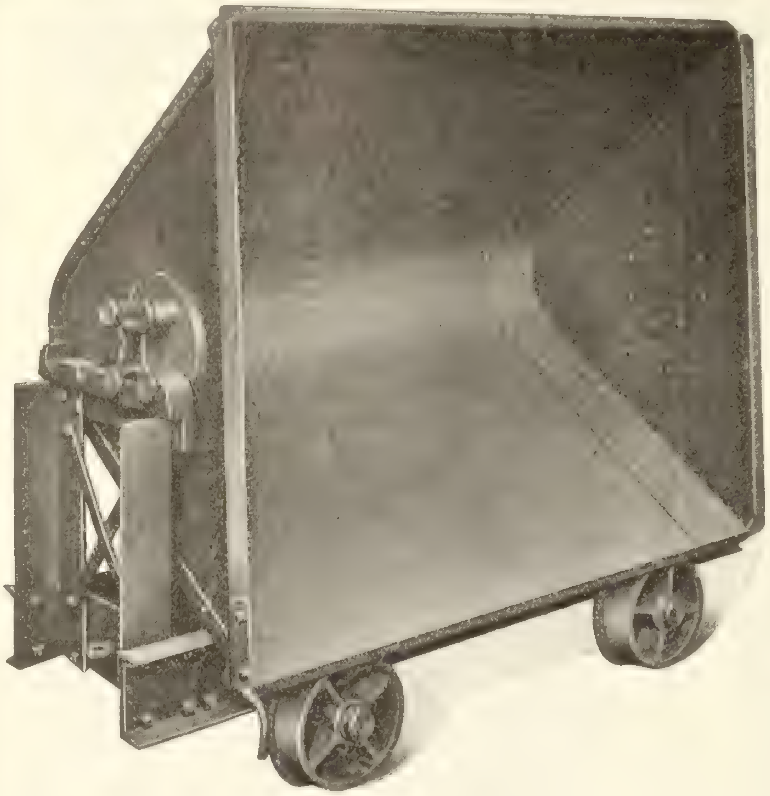
Canadian Representatives Wanted

Waterloo Cement Mach'y. Corp'n.
117 Vinton Street, Waterloo, Iowa

Look at the

Little Wonder "Five"
with the NEW
Side Loader





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Simplest, Strongest, Best

We make 'em in any size
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We also make Winding Drums and
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SEAMLESS and LAPWELDED
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Water, Salt, Oil and Gas Wells drilled to any depth up to 5,000 feet, any diameter.

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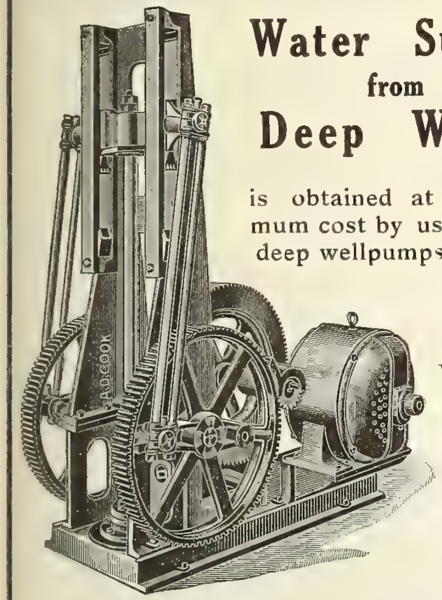

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is obtained at a minimum cost by use of our deep wellpumps.

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It is easy to obtain with our plants and apparatus

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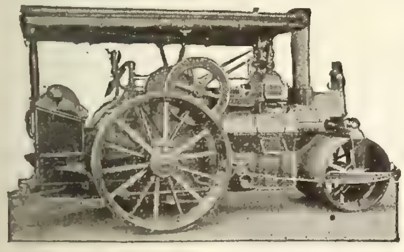

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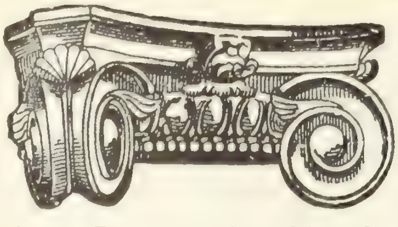

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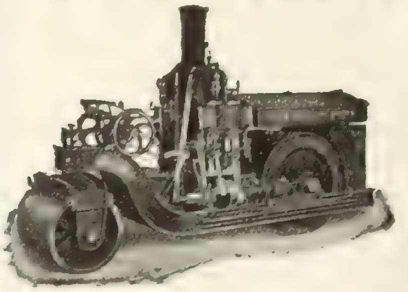

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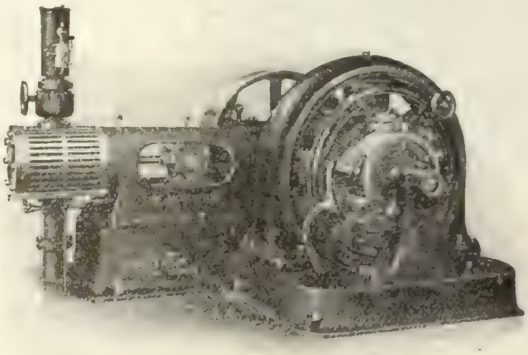

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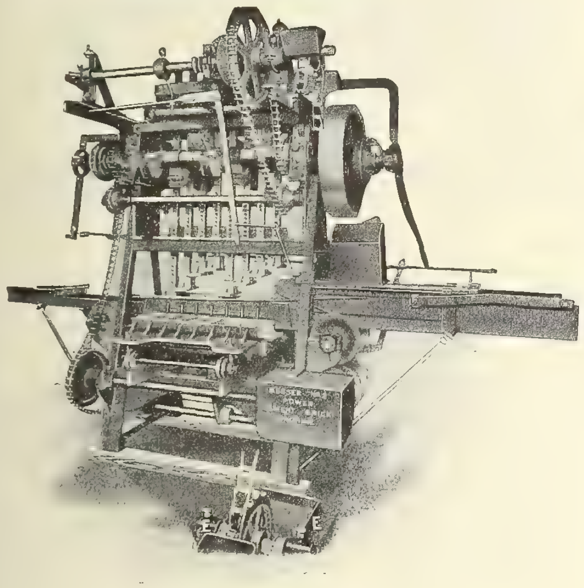

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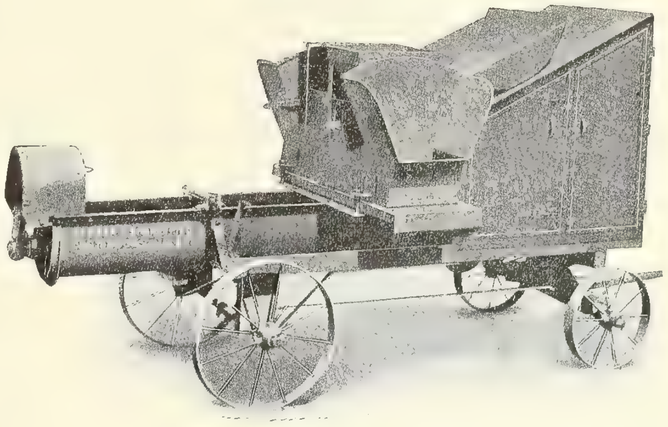

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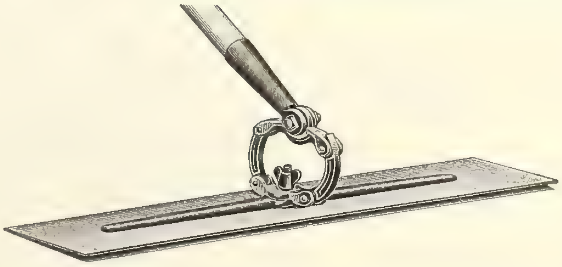

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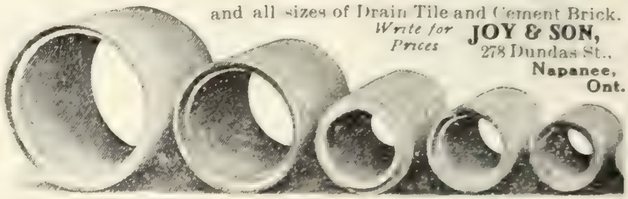

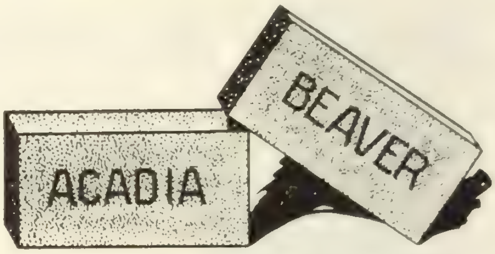

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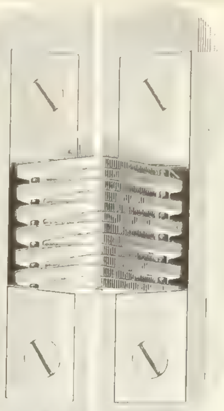

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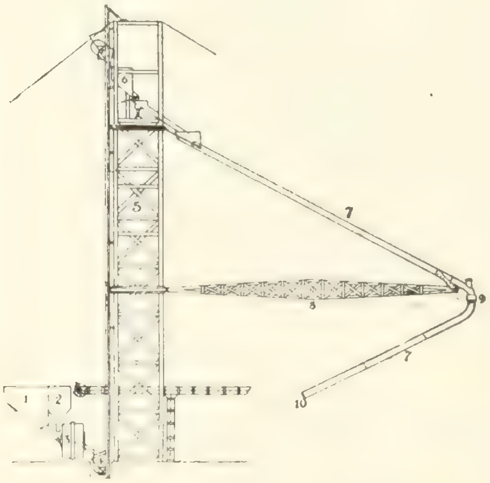

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Shapes —	of all kinds, **Beams, Angles, Channels, Tees, etc.,** also plates, bars, rods, checker plates, etc., in many sizes, weights and lengths, on hand.
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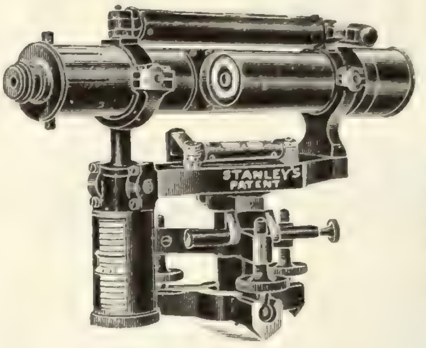

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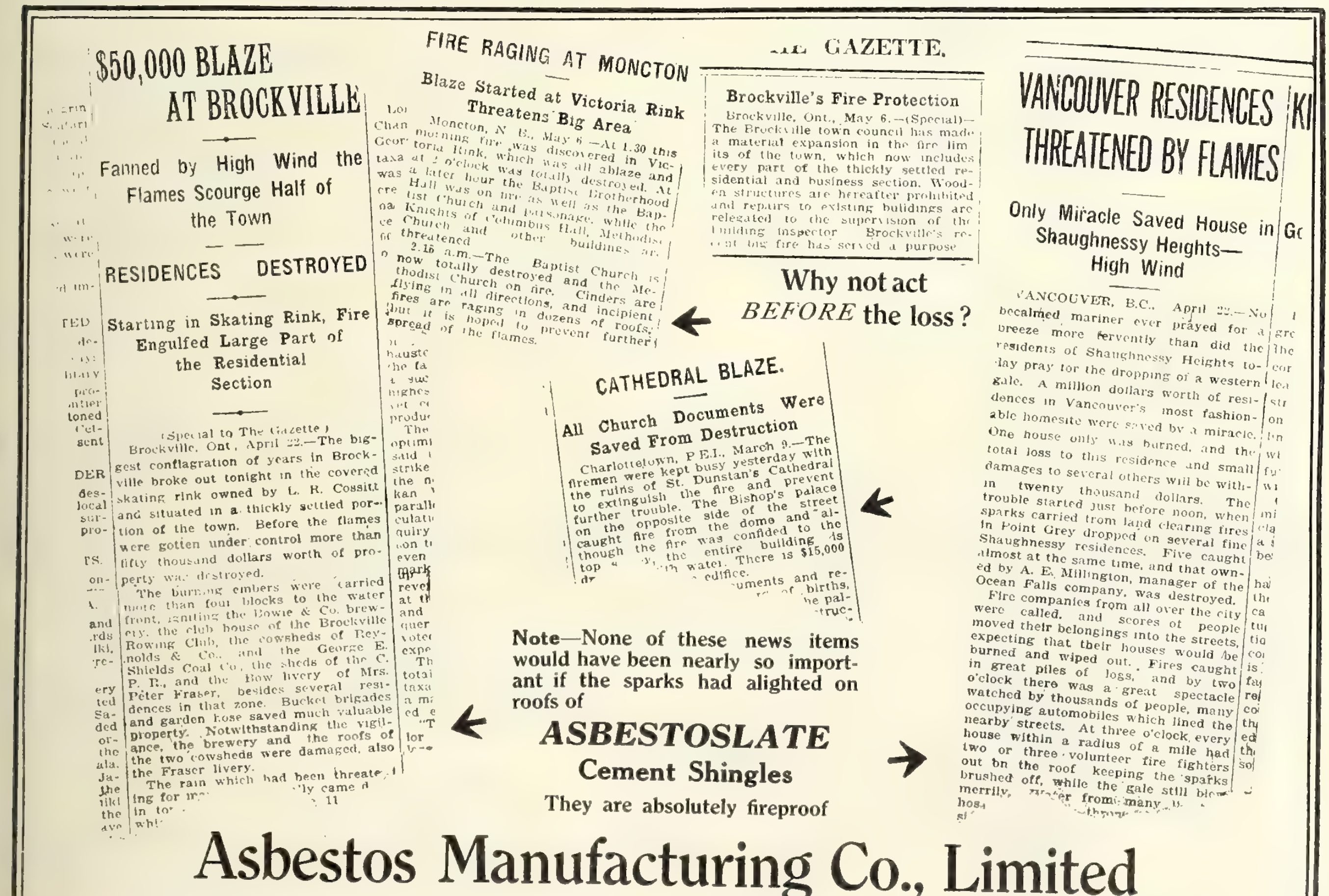

$50,000 BLAZE AT BROCKVILLE

Fanned by High Wind the Flames Scourge Half of the Town

RESIDENCES DESTROYED

Starting in Skating Rink, Fire Engulfed Large Part of the Residential Section

(Special to The Gazette.)

Brockville, Ont., April 22.—The biggest conflagration of years in Brockville broke out tonight in the covered skating rink owned by L. R. Cossitt and situated in a thickly settled portion of the town. Before the flames were gotten under control more than fifty thousand dollars worth of property was destroyed.

The burning embers were carried more than four blocks to the water front, igniting the Bowie & Co. brewery, the club house of the Brockville Rowing Club, the cowsheds of Reynolds & Co., and the George E. Shields Coal Co., the sheds of the C. P. R., and the Bow livery of Mrs. Peter Fraser, besides several residences in that zone. Bucket brigades and garden hose saved much valuable property. Notwithstanding the vigilance, the brewery and the roofs of the two cowsheds were damaged, also the Fraser livery.

The rain which had been threate

FIRE RAGING AT MONCTON

Blaze Started at Victoria Rink Threatens Big Area

Moncton, N. B., May 6.—At 1.30 this morning fire was discovered in Victoria Rink, which was all ablaze and at 2 o'clock was totally destroyed. At a later hour the Baptist Brotherhood Hall was on fire as well as the Baptist Church and parsonage, while the Knights of Columbus Hall, Methodist Church and other buildings are threatened.

2.15 a.m.—The Baptist Church is now totally destroyed and the Methodist Church on fire. Cinders are flying in all directions, and incipient fires are raging in dozens of roofs, but it is hoped to prevent further spread of the flames.

THE GAZETTE.

Brockville's Fire Protection

Brockville, Ont., May 6.—(Special)—The Brockville town council has made a material expansion in the fire limits of the town, which now includes every part of the thickly settled residential and business section. Wooden structures are hereafter prohibited and repairs to existing buildings are relegated to the supervision of the building inspector. Brockville's recent big fire has served a purpose

Why not act *BEFORE* the loss?

CATHEDRAL BLAZE.

All Church Documents Were Saved From Destruction

Charlottetown, P.E.I., March 9.—The firemen were kept busy yesterday with the ruins of St. Dunstan's Cathedral to extinguish the fire and prevent further trouble. The Bishop's palace on the opposite side of the street caught fire from the dome and although the fire was confided to the top ... the entire building ... with water. There is $15,000 ... edifice.

VANCOUVER RESIDENCES THREATENED BY FLAMES

Only Miracle Saved House in Shaughnessy Heights—High Wind

VANCOUVER, B.C., April 22.—No becalmed mariner ever prayed for a breeze more fervently than did the residents of Shaughnessy Heights today pray for the dropping of a western gale. A million dollars worth of residences in Vancouver's most fashionable homesite were saved by a miracle. One house only was burned, and the total loss to this residence and small damages to several others will be within twenty thousand dollars. The trouble started just before noon, when sparks carried from land clearing fires in Point Grey dropped on several fine Shaughnessy residences. Five caught almost at the same time, and that owned by A. E. Millington, manager of the Ocean Falls company, was destroyed.

Fire companies from all over the city were called, and scores of people moved their belongings into the streets, expecting that their houses would be burned and wiped out. Fires caught in great piles of logs, and by two o'clock there was a great spectacle watched by thousands of people, many occupying automobiles which lined the nearby streets. At three o'clock every house within a radius of a mile had two or three volunteer fire fighters out on the roof keeping the sparks brushed off, while the gale still blew merrily,

Note—None of these news items would have been nearly so important if the sparks had alighted on roofs of

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Cement Shingles

They are absolutely fireproof

Asbestos Manufacturing Co., Limited

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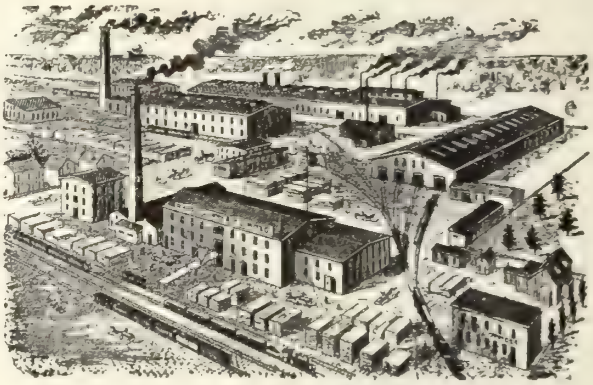

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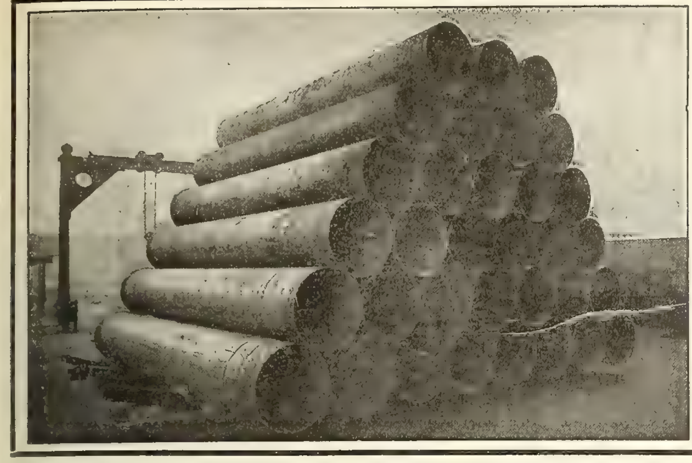

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WITH ANY TYPE OF JOINT
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GAS, WATER, SEWAGE, STEAM, Etc.

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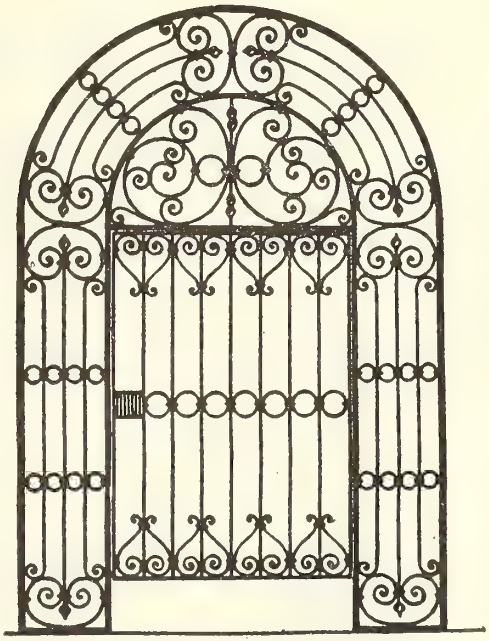

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of all descriptions

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of all designs in both iron and steel; Roofs, Telephone Poles, House Girders and all kinds of Structural Iron Work.

Our stock in hand comprises Steel Beams, Angles, Tees, Channels, Plates, Rolled Edged Flats, Bars, Rivets, Rounds, &c.; Iron Beams, Bars, Squares, Turnbuckles, Rivets, &c.

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Main Structural Shop: 130 ft. x 400 ft.
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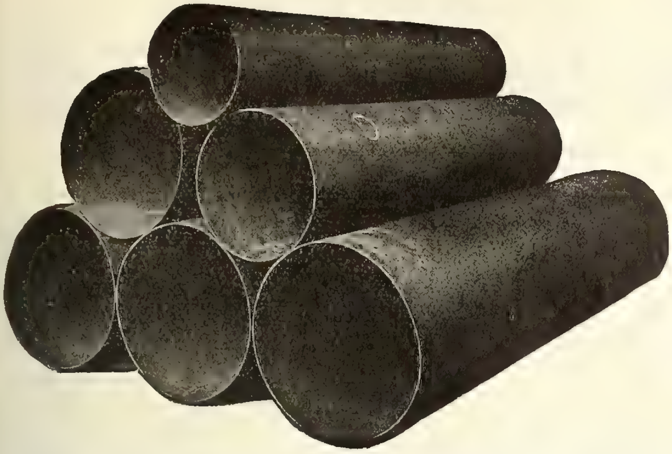

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We carry in stock

30 INCH DIAMETER

LAP WELDED STEEL PIPE

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The Des Moines Hemispherical Bottom Steel Tanks and Towers have been used and approved by nearly all leading Engineers. They are undoubtedly the most economical means of storing water at an elevation.

We have built many of these in Canada the United States and Mexico. Estimates cheerfully furnished.

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"Engineers desiring one of our Tank Calculators will receive same upon application."

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Standard Steel Construction Co.

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Manufacturers and Erectors of

Steel Buildings and Bridges

If you are intending to purchase **Steelwork** for any purpose, it will be to **your interest** to permit us to quote.

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NEW WESTMINSTER, B.C.

MANUFACTURERS OF

DOUBLE WIRE WOUND

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CAST IRON SPECIALS, VALVES, HYDRANTS, ETC.

"American" Enameled Brick

Have Permanent Value.

Adaptable for Exteriors and Interiors of all kinds of buildings.

Samples—in all standard colors—miniature or full size—submitted all charges prepaid.

Prompt attention given formal requests.

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1182 Broadway, New York

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WE ARE MANUFACTURERS OF

Structural Steel of All Kinds

Railway and Highway Bridges
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Beams, Channels, Angles, Plates, etc., in stock

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Cold Storage Builder and Engineer
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Contractor for **Cold Storage Buildings, Abbatoirs, Creameries** and similar structures where the insulation or waterproofing requirements call for special attention.

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FOR SALE
"TAMCO" Crushed Stone in all sizes, for all purposes. "Roman" building stone. "Milton" pressed bricks. Sanitary flooring, stone crushers, fire engines, &c.
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204 St. James Street,
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Crown Life Bldg.,
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We supply Iron or Brass Castings any weight or quantity and specialise in artistic ornamental and intricate metal work. Prompt delivery. Inquiries invited. Estimates free.

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Engineers Patternmakers, etc.
346 5th Ave. W., Vancouver, B. C.

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Laurentian Granite Co.

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MANUFACTURERS OF

Building Granite, Granite Setts, Curbing, Crushed Granite

Samples Furnished and Prices Quoted on Application

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Canada Lumberman & Wood Worker

Toronto, Canada

IRONITE

Flooring and Waterproofing

PROCESSES PATENTED

Send for Booklet

Canada Ironite Company
Waterloo, Ont.

Artificial Light Costs $ $ $
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BY means of accurately formed glass prisms you can have your building flooded with sunlight all day. Not merely at the windows but perfectly distributed to the darkest portions of the building.

The one best way to get such results is by the use of

Luxfer Prisms

Other prisms will admit daylight but Luxfer puts daylight where you want.
Always specify Luxfer—the first and best prism.

LUXFER PRISM COMPANY, Limited
100 King Street West, TORONTO

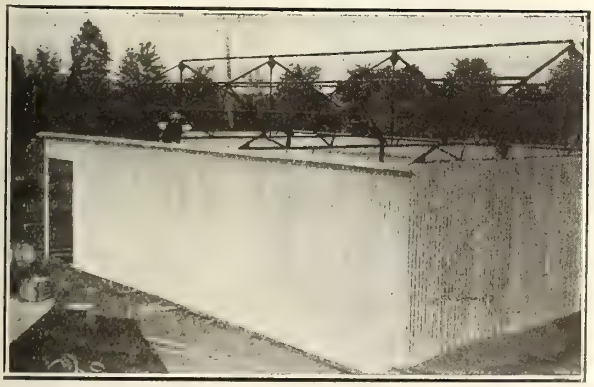
Storage Houses Oil Houses

¶ We have the best possible facility for making all kinds of storage houses of one storey, no matter of what dimensions.

¶ We will undertake to furnish and erect such buildings complete ready for occupancy.

¶ No steel building is too small or too large for us to figure on.

¶ We shall be pleased to furnish estimates and sketches on this class of work at any time. Write us and tell us what you need and we will prepare estimates for you at once.



Cut shows an all-steel building used for storing expensive patterns and dies. The size of this is 18′ x 39′ and it has been doing service for years and gives the same good service as when erected.

The Metal Shingle & Siding Company, Ltd.

Associated with
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INSPECTED AND LABELLED UNDER THE DIRECTION OF THE UNDERWRITERS LABORATORIES (INC.)
COSTS NO MORE THAN ORDINARY SO-CALLED FIRE DOORS.
LET US ESTIMATE ON YOUR NEXT REQUIREMENTS.

ALL OUR DOORS AND HARDWARE ARE LABELLED BY THE UNDERWRITERS.

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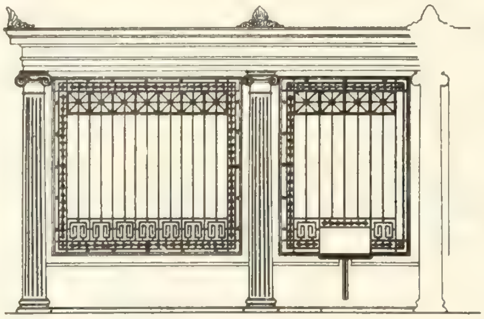

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Metal Work for Banks and Offices

Counter Grills Wickets
Tellers Cages, Brass Floor Railings
Door and Window Grills

We have a large, modern plating plant, enabling us to furnish all the latest electro-plated finishes.

Dennis Wire & Iron Works Co.
London, Ont. Limited
Toronto Branch : 36 LOMBARD STREET

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Limited
Montreal, Que.

SOLE producers of the Beautiful Royal Dominion marble quarried at South Stukely, Que. A card or 'phone call will bring our representative to submit figures on any class of marble work. Address all letters to the Company P.O. Box 1166, Montreal.

NOTICE TO OUR CUSTOMERS

¶ Please take note that our mills and Head Office are now located in Lyster, Megantic Co. where all correspondence should be addressed, and orders as in the past will be attended to promptly.

Lyster Wood Box Turning Enamelling Company, Limited
LYSTER
Successors to Automatic Wood Box & Turning Co., St. Romuald, Que.

We Manufacture

The Reliable Line of

VALVES

- Brass Globe and Gate.
- Steam and Hot Water.
- Packless Radiator.
- Iron Body "Keystone" Gate, (non-rising stem or outside screw and yoke, with screwed, flanged or hub end)
- Iron Body Swing Check.

Kerr Gate Hydrant.

Gate and Compression FIRE HYDRANTS

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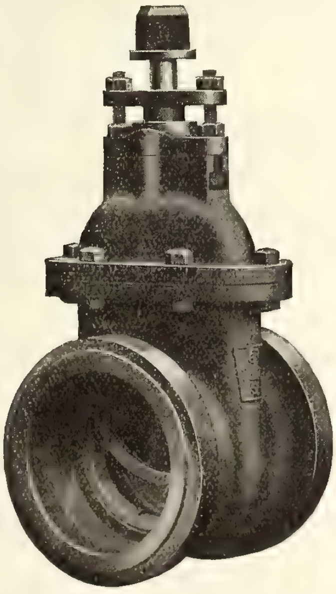
CRANES FOR FILLING WATER CARTS

VALVE BOXES
Screw Adjustable or Slide Adjustable



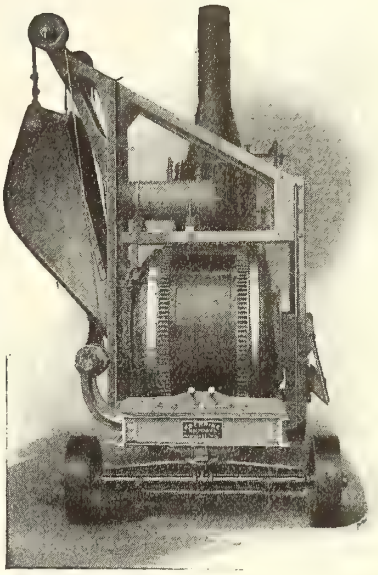
6" Hub End Gate

Forty Years of Experience has much to do with the satisfaction these goods give our customers.

THE KERR ENGINE CO.
LIMITED
WALKERVILLE, ONT.

The Mixer That Lasts

The Koehring "3 in 1"



We know that concrete mixers get hard service—and so we build THE KOEHRING to *stand* hard service.

We do it by putting the right kind of material into every part of THE KOEHRING—and *enough* material.

Its truck, for instance, is very rugged; it is made with a full 100% safety factor of strength.

Then there are features of design that add greatly to its lasting qualities.

For instance the rollers in THE KOEHRING are keyed onto the shaft *exactly as in a railroad truck*, preventing rapid wear of trunnion rollers and runaways and disalignment of drum, the cause of so many mixer troubles.

Our very complete side loader can be raised to an almost vertical position, so discharging into the drum *without pounding the bucket.*

Don't buy until you have investigated all these detailed superiorities of THE KOEHRING. The few points outlined here are but indications of the many you should know about.

The Koehring "3 in 1" Mixer Book No. 18 Gives Full Details

Glad to send you a copy

Koehring Machine Co.
Milwaukee, Wisconsin

Exclusive Sales Agent for Canada: CANADA FOUNDRY CO.
LIMITED—Toronto, Montreal, Halifax, Ottawa, Cobalt
Winnipeg, Calgary, Vancouver, Nelson.

Current Prices of Building Material

BRICKS

The following are wholesale prices delivered at Toronto:—

	Per M
No. 1 dry pressed red brick	$18 00
No. 1 dry pressed buff brick	18 00
Red Stock Bricks	13 00
Grey Stock Bricks	13 00
Wire cut bricks for foundation work	12 50
Porous terra cotta bricks	15 00
No. 1 enamelled bricks, all colors, from	$80 00 to $150 00
Sand-Lime Bricks	$11 00

LUMBER (Building Material)

Hemlock Lumber—

2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$27 00	
2 x 4 to 2 x 12, 16 ft.	27 00	
2 x 4 to 2 x 12, 18 ft.	30 00	
1 in. Hemlock, No. 1	26 00	28 00
No. 1 Hemlock Decking	26 00	28 00
No. 2 Hemlock dimension and 1-in.	20 00	22 00

Pine—

1 in. common pine 8 to 12 in. wide rough	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
⅞ x 8 and 10 in. pine shelving	36 00	42 00
⅞ x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine desking D2S	30 00	
Spruce Decking	28 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

Pine trim for paint finish—

4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8-in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

Shingles—

XXX B. C. Clear Shingles, per M.	3 90
N. B. Extras	3 75
N. B. Clears	3 10
No. 1 pine lath, per M.	5 00
No. 2 pine lath	4 50
No. 1 spruce lath	4 00

Cedar Posts—Fence—

5 in. at small end, each	30
7 in. at small end, each	35
Hemlock lath	3 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

	Star	D.D.
10 to 25 united inches	$4 25	$ 6 25
26 to 40 “	4 60	6 75
41 to 50 “	5 10	7 50
51 to 60 “	5 35	8 50
61 to 70 “	5 75	9 75
71 to 80 “	6 25	11 00
81 to 85 “	7 00	12 50
86 to 90 “		15 00
91 to 95 “		17 50
96 to 100 “		20 50
101 to 105 “		24 00
106 to 110 “		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for box lots:—

MONTREAL

	Star	D.D.
25	$3 25	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
90		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 u.i.	$3 50	$5 00
26/40	3 75	5 50
41/50	4 25	6 25
51/60	4 75	7 00
61/70		8 00
71/80		9 00
81/85		10 00
86/90		11 00
91/95		13 00
96/100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

STEAM FITTERS' AND PLUMBERS' SUPPLIES

Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock ...... net $1.85

No. 4½ Fuller's .... net $2.50

Square head brass cocks, 65 per cent.

Lead Pipe

Lead pipe, $7.50, less 10 per cent.; lead waste, $9.00, less 10 per cent.; caulking lead, 6¾ cents per lb.; traps and bends, 35 per cent.; pig lead, 5¾ cents per lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.28	¼ inch	$3.18
⅜ “	2.28	⅜ “	3.18
½ “	2.72	½ “	3.57
¾ “	3.28	¾ “	4.43
1 “	4.85	1 “	6.55
1¼ “	6.56	1¼ “	8.86
1½ “	7.84	1½ “	10.59
2 “	10.55	2 “	14.25
2½ “	16.67	2½ “	22.52
3 “	21.80	3 “	29.45

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

Soil Pipe and Fittings

Medium and extra heavy pipe and fittings, up to 6-inch, 60 and 5 per cent.

7 and 8-inch pipe, 45 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

CEMENT, STONE, STEEL, Etc.

Cement, barrel lots, in bags, delivered, Toronto, bags extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ¾-inch, $1.45.

Burnt River rubble stone delivered, $17 to $18 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¾ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

Free stone delivered, $17 to $18 per toise.

Brown coursing stone, delivered, $3.75 per yard.

Grey coursing stone, delivered, $2.50 to $2.75 per yard.

Sand, for cement or brick work, $1.15 a cubic yard, f.o.b. Toronto, C. P. R. sidings.

Sand, for cement or brick work, 90c to $1.05 a cubic yard, f.o.b. Toronto, G. T. R. sidings.

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

Steel channels and beams, angles and plates, $2.65 to $3.00 per 100 pounds, delivered f.o.b. Toronto.

Hard Wall Plaster, unsanded, from $7.00 to $8.50, bags extra; sanded, $4.50 in car lots; hydrated lime, $9.00 in car lots.

Lime, per cwt., delivered, not less than 1,500 lbs. 33 cents; white, 43 cents.

Plaster of Paris, Anchor and Crown Brands, $1.50.

Manilla Rope, best, per pound, 12½ cents.

PAINT AND OILS

Pure White Lead, ground in oil, $8.50 per 100 lbs.

Boiled Linseed Oil, in bbls., 64c. per gal. of 9 lbs.

Raw Linseed Oil, in bbls., 61c. per gal. of 9 lbs.

Turpentine, in barrels, 56c. per gallon.

Pure Red Lead, dry $6.50 to $7.50 per 100 lbs.

Putty, pure linseed oil, in bulk, bbls., 3½c.

Putty, pure linseed oil, in 25-lb. tins, 4c.

Argenteuil Granite Co., Limited

42 Craig Street West, MONTREAL

We are in the market to bid on your plans for granite on buildings.

Our up-to-date cutting plant, excellent quarries and good shipping facilities enable us to make close prices.

SEND US BUILDING PLANS TO - DAY

MISSISQUOI-LAUTZ CORP'N LIMITED

Producers, Importers and Workers in Marble

ANNOUNCE

the opening of their New Office and Showroom at

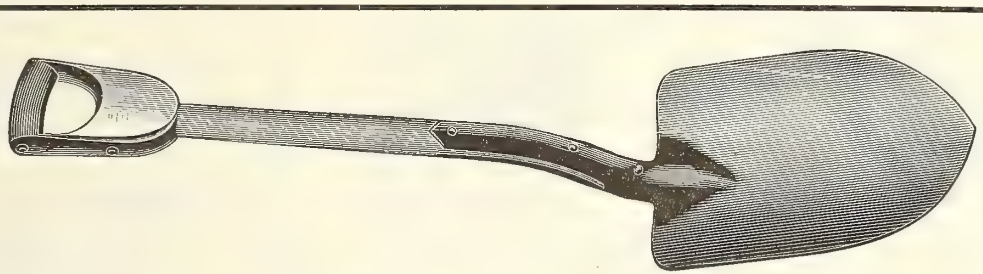
208 Read Building,
MONTREAL

Displaying a complete line of **MISSISQUOI** And all varieties of Foreign **MARBLES**

Which are open for inspection at all times
to Architects, Builders and Contractors.

Any Request to Submit Tenders Will be Given Prompt Attention.

Trade Mark



LUNDY SHOVELS

Competition is met and profitable contracting achieved by the use of up-to-date equipment in every branch of the contracting business.

When it comes to digging let your men do more efficient work by supplying them with "Lundy" or "Dandy" shovels.

They enjoy a national reputation for rigid construction and durability.

We will send to any contractor, free, express prepaid a sample shovel. Send for our illustrated catalogue showing our full line of Shovels, Spades, Scoops, Draining Tools, etc.

THE LUNDY SHOVEL & TOOL CO., LTD.

General Office and Works: PETERBORO, ONTARIO

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N. B. MISENER, TORONTO

SELLING AGENTS
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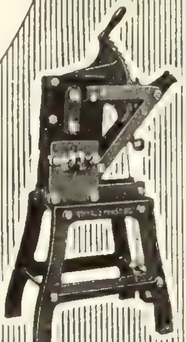
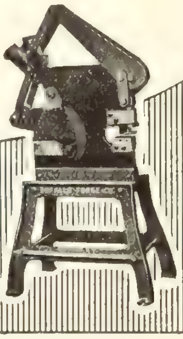
TEES & PERSEE OF ALBERTA, LTD., CALGARY ; E. E. CRANDALL, VANCOUVER, B.C.

"Buffalo" Punches Shears and Drills

Among our recent designs is the Bar Cutter No. 10 for cutting concrete reinforced bars—twisted, round or any other shape. It cuts bars up to 1⅛" thick and, due to its steel frame, its **weight is only half** that of a cast iron machine of the same capacity. Ask for catalog of Steel Punches, Shears and Drills No. 145.

Canadian Buffalo Forge Co.
MONTREAL Limited
St. John Winnipeg
Toronto Vancouver





"Buffalo" Forges

"Built to Last"

is the slogan of our **1912 Rivet Forge.** The repair cost by this design is guaranteed to be actually **cut in two,** compared with any other forge now in the market. A bridge company using a large number of forges writes us regarding it: "The operator claims it runs easier and heats more rivets in less time than any forg he has ever used." Let us send you one on free trial. Fifty other styles, for light and heavy work.

Canadian Buffalo Forge Co.
Limited
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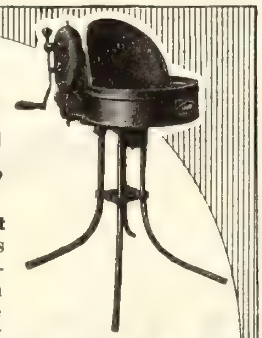
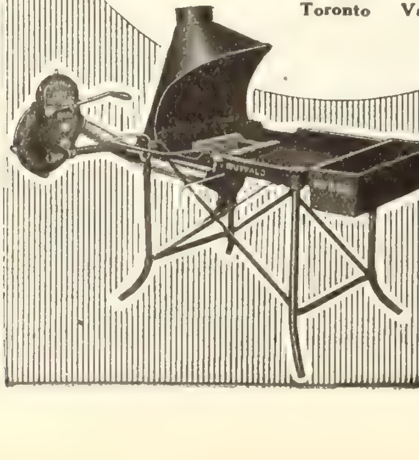
St. John Winnipeg
Toronto Vancouver





Structural Water-proofing

"DEHYDRATINE"
For Water-proofing under the membranous method.

"HYDRATITE"
For Water-proofing Concrete.

"FERRO FAX"
For Surface Hardening Concrete Floors.

"SYMENTREX"
A Cement Coating—Makes Surfaces Water Shedding.
MADE IN COLORS

"These Trade Names protect you against the possible selection of inferior materials. Whether you prefer a water-proof paint or a compound, we can give you satisfactory assurance as to the reliability of these products."

"FOR 15 YEARS STANDARD OF THEIR KIND."

Pinchin-Johnson & Co.
(Canada) Limited
Minerva House, - Toronto
Write for Particulars and Architect's Hand Book (1913 edition)

AGENCIES IN ALL CITIES

The ribs on the bottom prevent slipping when used at an angle

POWER

Combined with Easy Operation

This is accomplished by a single arrangement of gears, which so compounds the leverage in Barrett Geared Jacks, that heavy loads up to 40 tons are raised as easily as the ordinary type of jack raises a light load.

BARRETT Automatic Geared JACKS

are designed for the rapid and convenient handling of freight cars, Passenger or Pullman Coaches, Locomotives, etc. They are made in capacities of 20 to 40 tons and a variety of heights. Simplicity of design and construction, and the absence of any complicated features insures freedom from maintenance and repair charges.

Our catalog No. 15 illustrates many sizes and styles of jacks—Write for a copy today

The Canadian Fairbanks-Morse Co., Limited

Montreal St. John Ottawa Toronto Winnipeg Calgary
Saskatoon Vancouver Victoria

4

Across Canada with the Imperial Wire & Cable Company, Limited

Toronto Montreal Winnipeg

First of a series of advertisements showing buildings of national importance which have been wired with Imperial Wire & Cable Co.'s, Limited, wires.

This picture shows

The Ritz-Carlton Hotel, Montreal

Architects—Warren & Wetmore—New York.
Engineers—Mailloux & Knox—New York.
Electrical Contractors — J. Livingston & Co. —New York.

This hotel was wired with "Imperial" Higrade Rubber Insulated Wire.

Address enquiries to nearest office, Montreal, Toronto, Winnipeg; Alberta and British Columbia enquiries to Northern Electric & Manufacturing Co., Limited, Calgary and Vancouver.

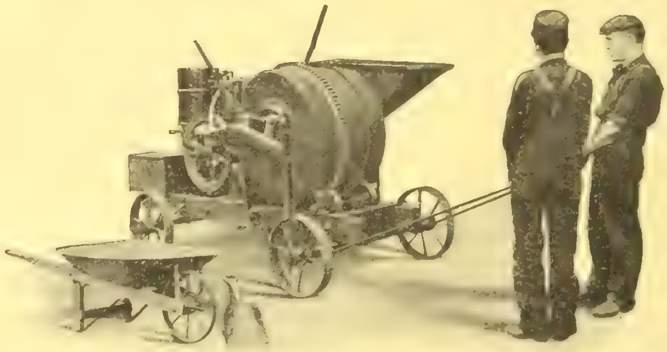
Everybody Who Builds

Concrete Walls, Concrete Walks or Curbs, Concrete Anything

can have the best Concrete that can be made at the least possible cost

BECAUSE

Our No. 4 RANSOME MIXER



No. 4 Ransome Concrete Mixer.

is the equal of our larger machines in efficiency and is sold at a price which makes it an easy and a wise purchase for anybody.

It has a batch capacity of 4 cubic yards per hour, which is ample for any small concrete job. No. 4 Mixers are sold in one way only : i. e.—mounted on Trucks, with gasoline engine, direct drive. This is a powerful engine for its rated H. P. and the best designed—a most perfect operating engine.

The No. 4 Ransome is a great time saver in every respect. As we equip these machines with a special batch charging hopper, which is being filled while the batch in the drum is mixing—no time is lost in charging drum. By the simple lever arrangement, the whole unmixed batch is fed into the drum in an instant and the loading gang keeps right on with their work without any waits whatever. The batch is instantly discharged by merely reversing the discharge chute.

Let Us Send You Particulars

F. H. Hopkins & Co.

MONTREAL

BRANCH OFFICES: General Supply Company of Canada, Ltd., Winnipeg Agents
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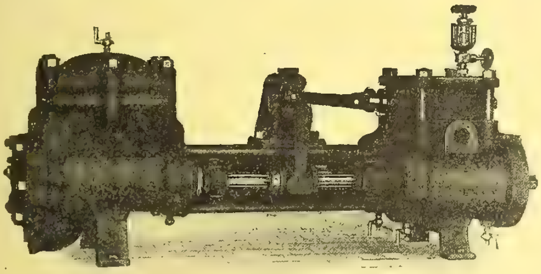
Vol. 27 Toronto, August 6, 1913 No. 32

ESTABLISHED 1886

Contract Record and Engineering Review

Steam and Power Pumps, Condensers and Travelling Cranes



The Smart-Turner Machine Co.
LIMITED
HAMILTON, CANADA

"MADE IN CANADA"

Bent Glass

Made in all Kinds of Glass on Short Notice

Large Bent Plate Glass for Shop Fronts a Specialty

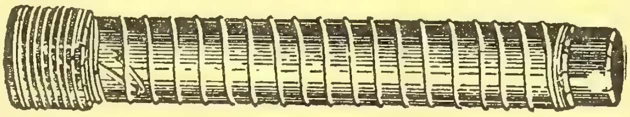
The Toronto Plate Glass Importing Company, Limited
(HILL & RUTHERFORD, Managing Directors)
Head Office and Works: 91 to 133 Don Roadway
TORONTO

INGERSOLL-RAND
SHEET PILE DRIVERS

- —Prove the Value of Experience.
- —Utilize all the Energy.
- —Have Standard Mechanism.
- —Are Handled with Facility.

Send For K-139.

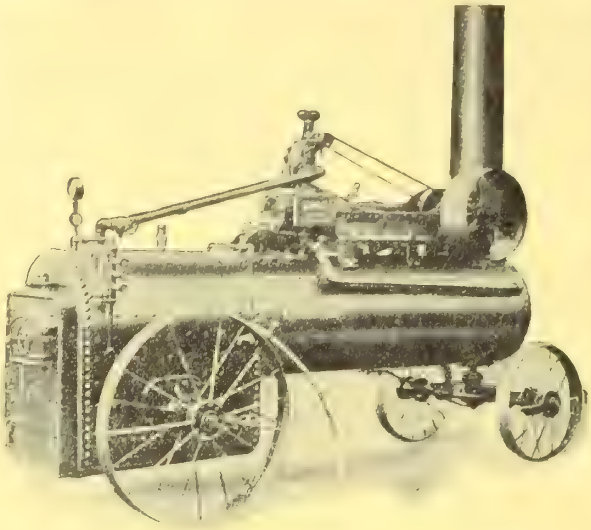
Canadian Ingersoll-Rand Co., Limited
MONTREAL, CAN.



Continuous and Machine Banded Wood Stave
WATER PIPE
RESERVOIR TANKS
for city and town Water Systems, Fire Protection, Power Plants, Hydraulic Mining, Irrigation, etc. One-half the cost of Iron Pipe—and better.

Pacific Coast Pipe Co., Limited
P. O. Box 563 Vancouver, B. C.
Office and Factory, Granville St., near High Bridge
WRITE FOR CATALOGUE
Full Particulars and Estimates Furnished

Alphabetical Index of Advertisers, Page 16 Classified Directory to Advertisements, Page 6



Portable Power Plants

The cut shows one of our compact and *portable* power plants for driving Crusher Outfits, etc. A complete power plant in itself—durable and efficient. We build different sizes and can meet your requirements precisely.

Contractors' Supplies

We also build Boilers, Air Compressors, Engines, Derrick Engines, Hoists of all kinds, Crushers, Screens, etc.

Any of our offices will gladly furnish catalogs and particulars.

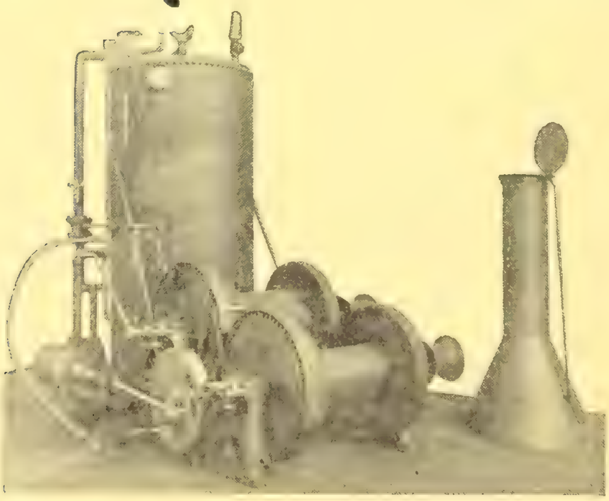
THE JENCKES MACHINE COMPANY, LIMITED

Sherbrooke St. Catharines Montreal Cobalt
South Porcupine Vancouver Nelson

No Other Hoisting Engine Built

can do as much severe work as the

"AMERICAN"



It does its work with less human power, fuel, wear and expense, and with greater speed and accuracy than any other similar engine on top of earth.

When you need a Hoisting-Engine, let us prove these claims to you.

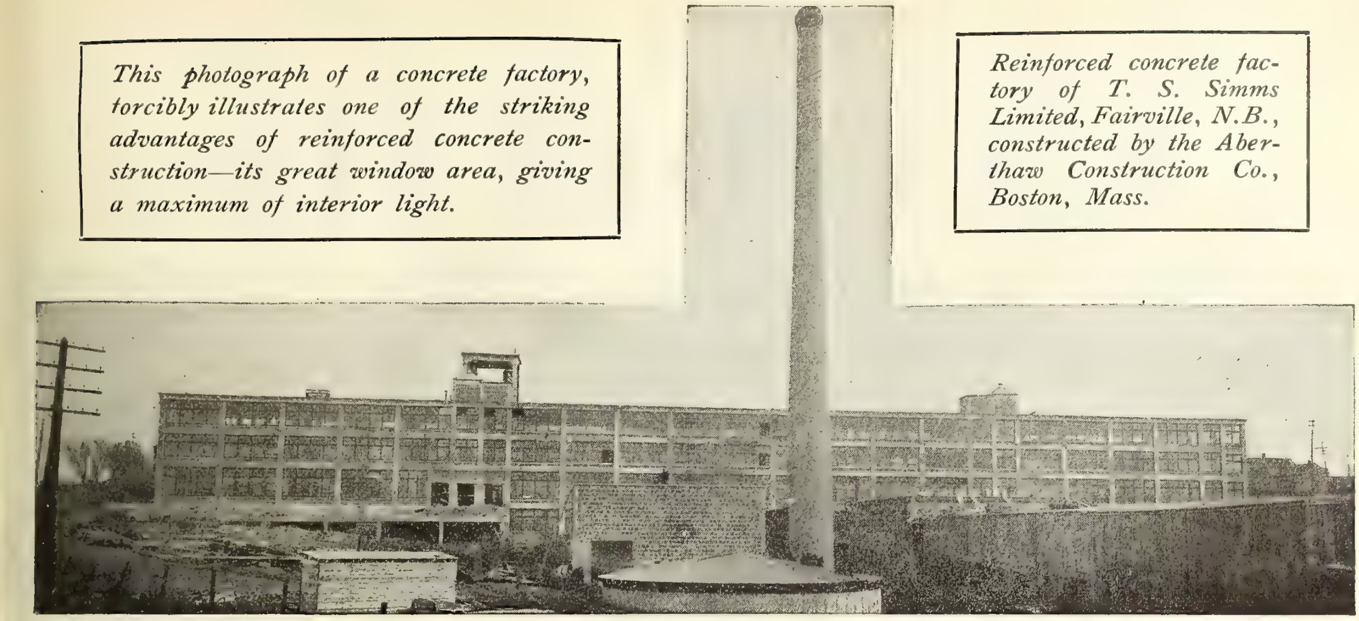
American Hoist & Derrick Co.

ST. PAUL, MINN.

Gorman, Clancey Grindley, Edmonton and Calgary, Alta., and Nelson, B.
Vancouver Machinery Depot, Ltd., Vancouver, B. C.
Stuart Machinery Co., Winnipeg, Man.
General Supply Co. of Canada, Ltd., Montreal, Ottawa, Toronto, Canada.

This photograph of a concrete factory, forcibly illustrates one of the striking advantages of reinforced concrete construction—its great window area, giving a maximum of interior light.

Reinforced concrete factory of T. S. Simms Limited, Fairville, N.B., constructed by the Aberthaw Construction Co., Boston, Mass.



Concrete Factories are Most Efficient

The efficiency of a machine is the ratio of the amount of work a machine does to the amount of work required to operate it. The output is equal to the input minus the work lost or wasted. The less wasted the greater the efficiency.

In the same way the efficiency of a factory may be defined as the ratio of output to input. Output financially, is increased by reducing unnecessary expenses.

Concrete Stops Wastes

Concrete buildings are proof against fire, water and vermin. They give the maximum light and are sanitary. They resist vibration, and are permanent and durable.

Fire-proofness reduces insurance rates. Water or liquids used in certain processes will not leak through floors to destroy valuable goods below. Rats and other vermin find no place to live in a concrete building, thus eliminating losses from this cause. Maximum light and sanitary conditions increase efficiency of employees. Lack of vibration reduces wear and tear on machines. Permanency and durability reduce depreciation.

The way in which concrete stops these leaks is fully described in our handsomely illustrated 224 page book, "Factories and Warehouses of Concrete." It contains photographs and data of factories and warehouses for all classes of industries.

You can have a copy free if you will mention this advertisement.

Canada Cement Company

Limited

Montreal

PILE DRIVING

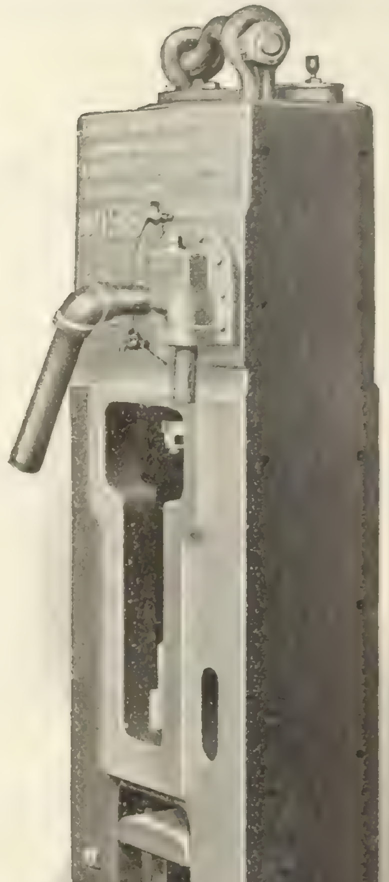
is done with greater economy, speed an
penetration with the

Arnott PILE DRIVING **Hammer**

They have replaced Drop Hammers on many jobs.

Operated by steam or air.

For all kinds of driving, from the heaviest Concrete Pile and Steel Sheeting to the lightest Wood and Steel Sheeting.



Montreal, 318 St. James St.
Toronto, 155 West Richmond St.
Cobalt, opp. Right of Way Mine.
Winnipeg, 259-261 Stanley St.

MUSSENS

TERRY & TENCH

Derricks and Derrick Fittings

Carried in Stock

LIMITED

Calgary, 10th Ave. & 3rd St. E.
Vancouver, 365 Water Street
Quebec, 71 Maple Ave.
St. John, N.B., 57 Smythe St.
Halifax, 78 Granville St.

CLASSIFIED INDEX TO ADVERTISEMENTS

The following regulations apply to all advertisers:—Eighth page, two headings quarter page, four headings; half page, eight headings; full page, sixteen headings.

Air Compressors
Canadian Allis-Chalmers, Limited.
Canadian Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd.
Escher Wyss & Co.

Architects
Weeks, Arthur L.

Architects' Instruments
Stanley Co., W. F.
Ainsworth & Sons, Wm.
W. & L. E. Gurley.

Architectural Iron Work
Canadian Allis-Chalmers, Limited.
Canada Wire & Iron Goods Co.
Dennis Wire & Iron Works.
Dom. Ornamental Iron Works.
McGregor & McIntyre
Meadows Co., Geo. B.
Steel & Radiation Ltd.

Architectural Metal Work
Feather & Roadhouse.
Ormsby Co., Limited, A. B.
Metal Shingle & Siding Co.
Metallic Roofing Co.

Architectural Terra Cotta
Black Building Supply Co., Ltd.
Don Valley Brick Works.
Gibbs & Canning.
Northwestern Terra-Cotta Co.
Toronto Plate Glass Imp't'g Co.

Asphalt
Asphalt & Supply Co.
Barber Asphalt Paving Co.
Canadian Mineral Rubber Co.

Belting
Can. Consolidated Rubber Co.
Goodyear Tire & Rubber Co.
Can. Fairbanks-Morse Co.
Dominion Belting Co.

Blowers
Canadian Buffalo Forge Co.
Can. Ingersoll-Rand Co., Ltd.
Canadian Sirocco Co.
Douglas Milligan Co.
Sheldons Limited
Sturtevant Co. of Can. Ltd., B. F

Boilers
Berg Machinery Mfg. Co.
Canadian Allis-Chalmers, Limited.
Boving Company of Canada.
Inglis Co., John.
Jenckes Machine Co.
Leonard & Sons, E.
Marsh & Henthorn.
McDougall Caledonian Iron Wks.
Mussens Limited.
Waterous Engine Works Co.

Boxes—Junction.
Standard Underground Cable Co. of Canada Limited.

Brewers' Machinery
Linde British Refrigeration Co.

Brick
American Enamelled Brick Co.
Black Building Supply Co., Ltd.
Bradford Pressed Brick Co.
Douglas Milligan Co.
Don Valley Brick Works.
Hamilton Pressed Brick Works.
North-Western Terra Cotta Co.
Nova Scotia Clay Works.
Sydney Pressed Brick Co.

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Canadian Kellogg Co.
Douglas Milligan Ltd.
Heinicke Co., H. R.

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Berg Machinery Mfg. Co.
Sheldons Limited

Brick Dryers
Bechtels Limited.
Berg Machinery Mfg. Co.
Canadian Buffalo Forge Co.

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Canadian Bridge Co.
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Des Moines Bridge and Iron Co.
Dickson Bridge Works.
Dominion Bridge Co.
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McNeil & Co., W. P.
National Bridge Co.
Phoenix Bridge & Iron Works.
Sarnia Bridge Co.
Scherzer Rolling Lift Bridge Co.
Structural Steel Co.
Standard Steel Construction Co.

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Browning Engineering Co.
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Lecky & Collis.
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Imperial Wire & Cable Co.
Standard Underground Cable Co. of Canada, Limited.

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Britnell & Co.
Bremner, Alex.
Canada Cement Co.
McNally & Co., W.
Morrison & Co., T. A.
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Rogers, Alfred Limited
Smyth & Ryan.

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Abram Cement Tool Co.
Wettlaufer Bros.

Coal Chutes
Galt Stove & Furnace Co.

Coal Handling Apparatus
American Hoist & Derrick Co.
Browning Engineering Co.
Brown Hoisting Machinery Co.

Combination Woodworkers
Hutchinson, M.

Concrete Mixers and Appliance ..
Blystone Machinery Co.
Canadian Allis-Chalmers, Limited.
Canadian Concrete Appliance Co.
Chain Belt Company.
Hopkins & Co., F. H.
Koehring Machine Co.
Lecky & Collis.
London Concrete Machinery Co.
Mun. Eng. & Contracting Co.
Mussens Limited.
Waterloo Cement Machinery Co.
Wettlaufer Bros.
Woodstock Wind-Motor Co.

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Can. H. W. Johns-Manville Co.
Conduits Co., Limited.

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Foundation Co.
Reggin & Spence.

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Doty Marine Engine & Boiler Co.
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Hopkins & Co., F. H.
International Marine Signal Co.
Lecky & Collis.
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Stinson-Reeb Builders' Supply Co
Troy Wagon Company.
Woodstock Wind-Motor Co.
Wettlaufer Bros.

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Weller Mfg. Company.

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Can. Ingersoll-Rand Co., Ltd.

Cork Installation Machinery
Linde British Refrigeration Co.

Corrugated Iron
Can. H. W. Johns-Manville Co.
Metallic Roofing Co.
Ormsby, A. B., Limited.

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Browning Engineering Co.
Brown Hoisting Machinery Co.
International Marine Signal Co.
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Cabot, Inc., Samuel.

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Ontario Lime Co., Ltd.
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Hopkins & Co., F. H.
Jenckes Machine Co.
Lecky & Collis
London Concrete Machinery Co.
Mussens Limited.
Wettlaufer Bros.

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Hepburn, John T.

Dredges
Beatty & Sons, M.
Browning Engineering Co.

Drills
Beatty & Sons, M.
Canadian Allis-Chalmers, Limited.
Canadian Buffalo Forge Co.
Canadian Ingersoll-Rand Co.
Lecky & Collis.
Star Expansion Bolt Co.

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Harvey, J.

Drill Steel Sharpeners
Canadian Ingersoll-Rand Co.

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Schell Foundry & Machine Co.
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Electric Air Rock Drills
Canadian Ingersoll-Rand Co.

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Ferranti Electrical Co.

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Canadian Buffalo Forge Co.
Inglis Co. John.
Jenckes Machine Co.
Laurie & Lamb.
Leonard & Sons, E.
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Sturtevant Co. of Can. Ltd., B. F
Waterous Engine Works Co.
Wettlaufer Bros.

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Campbell, R.
Chipman & Power.
Farmer, John T.
Galt Engineering Co., John
Lea & Ferguson.
Mitchell, C. H.
Thorold Co., F. W.

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Star Expansion Bolt Co.

Expanded Metal
Mannesmann Tube Co.

Exhaust Heads
Canadian Buffalo Forge Co.
Sheldons Limited.
Sturtevant Co. of Can. Ltd. B. F.

Field Instruments
Gurley, W. & L. E.

Filler, Floor and Sewer Joint Asphalt
Canadian Mineral Rubber Co.

Filters
American Water Softener Co.

Fire Brick
Improved Equipment Co.
Ontario Lime Co., Ltd.
Smyth & Ryan.

Fire Escapes
McGregor & McIntyre

Fireproof Doors and Windows
Feather & Roadhouse.
Metal Shingle & Siding Co.
Mussens Limited.
Ormsby Co., Limited, A. B.
Steel & Radiation Ltd.

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Lecky & Collis.

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Canadian Buffalo Forge Co.
Sheldons Limited.
Canadian Sirocco Co.

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Improved Equipment Co.

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Wettlaufer Bros.

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Improved Equipment Co.

Gas Producers for Heating
Improved Equipment Co.

Gas Machinery
Improved Equipment Co.

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Hobbs Mfg. Co.
Luxfer Prism Co.
Toronto Plate Glass Imp't'g. Co

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Canadian Buffalo Forge Co.
Canadian Sirocco Co.
Sheldons Limited

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Escher Wyss & Co.
Pittsburgh Valve, Foundry & Construction Company.

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Beatty & Sons, M.
Browning Engineering Co.
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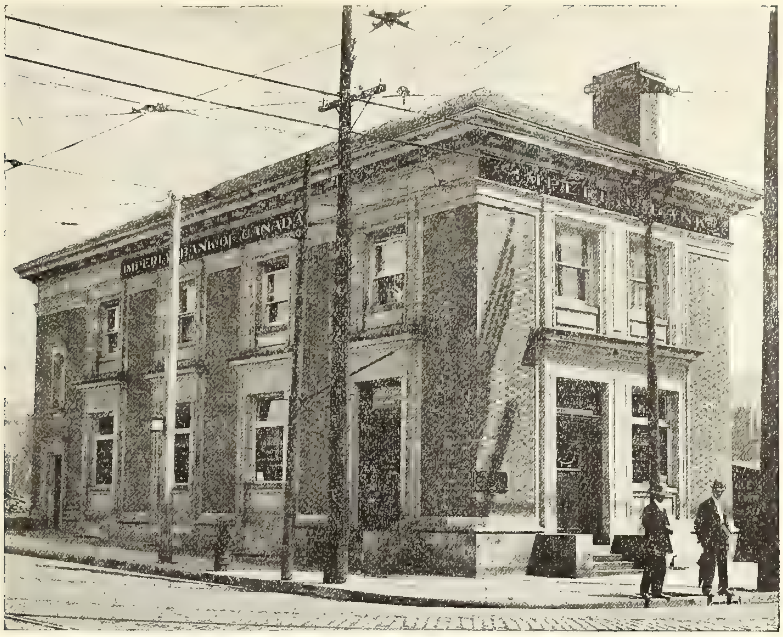
Lecky & Collis.
Marsh & Henthorn.
Mussens Limited.
Royce Limited
Sturtevant Co. of Can. Ltd. B. F.

Hoisting Engines
Canadian Allis-Chalmers, Limited.
Canadian Fairbanks-Morse Co.
Wettlaufer Bros.

Hydrants
Canada Iron Corporation.
Gartshore-Thomson Pipe Co.
Kerr Engine Co.

(Continued on page 12)

DON VALLEY



Imperial Bank, Roncesvalles Ave. and Queen St., Toronto

THE Don Valley Buff Oriental Bricks are particularly well suited for bank and public buildings. They are burned to give a variety of flashes which lend a soft and pleasing effect to any building.

For Toronto's General Hospital over twenty million of these brick were used.

The decorative possibilities of Don Valley Bricks are without number and that they add distinction and attractiveness to a building is acknowledged.

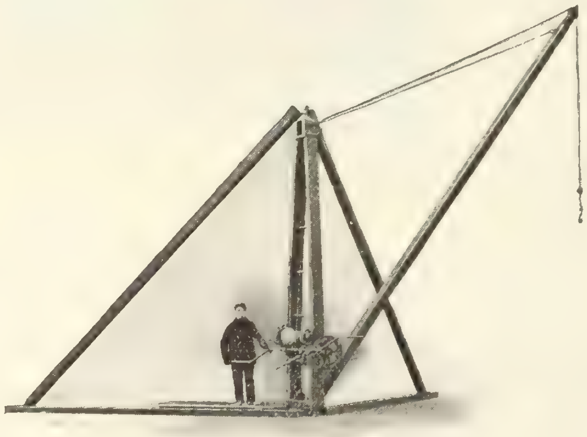
Specify Don Valley Bricks

Don Valley Brick Works

Toronto, Ont.

Beath Scotch Derricks

Hand or Power



THE construction of Beath Scotch Derricks embodies several points of merit not found in other makes.

All stress parts are **steel** not cast iron. Bottom Pintle Bearing is of ball and socket type and works in a bath of oil, thus ensuring an easy movement at this joint.

Beath Derricks are provided with self-oiling bearings, ensuring easy operation and reducing wear to a minimum.

We also make Jinniwink Derricks, Stiff Leg Derricks, Guy Derricks, and Steel Derricks for heavy service. Hand or Power operated.

Send us your enquiries for Derricks

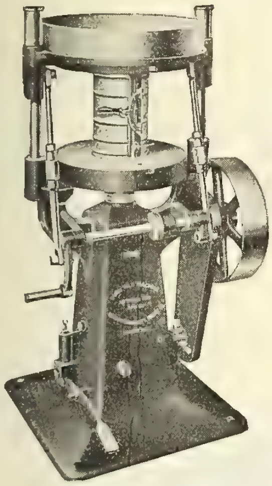
W. D. Beath & Son, Limited

ENGINEERS AND MANUFACTURERS

20-30 Cooper Ave., Toronto

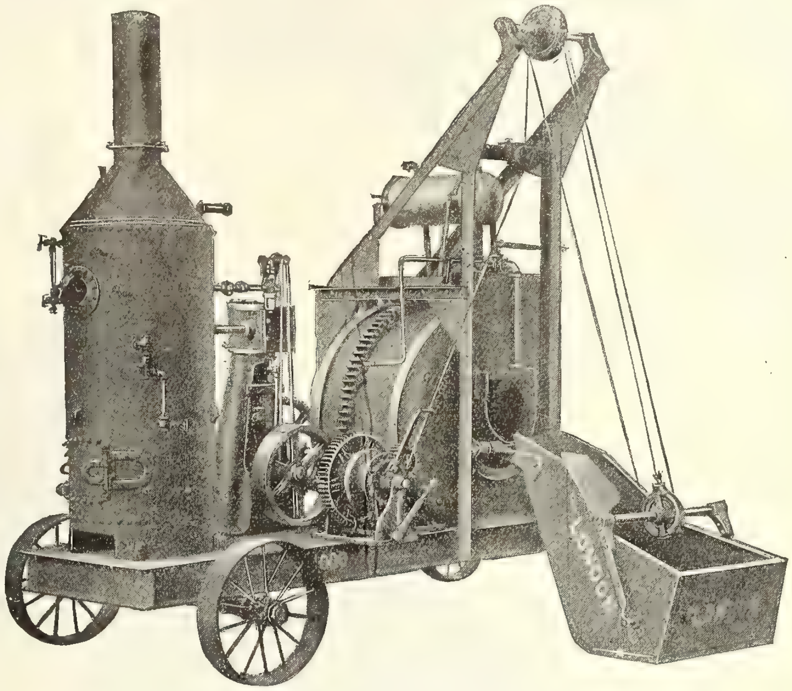
LONDON CONCRETE MACHINERY

Is Not Built Down to a Price, but Up to a Standard.



Dunn Cement Drain Tile Machine

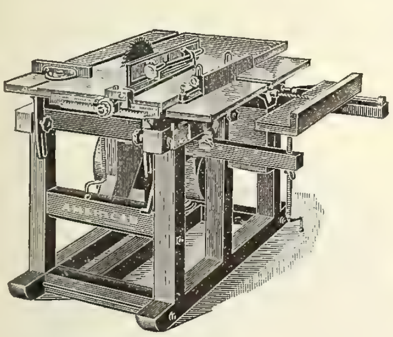
We Cannot Afford to Make anything but the Best.



London Standard Drum Batch Mixer

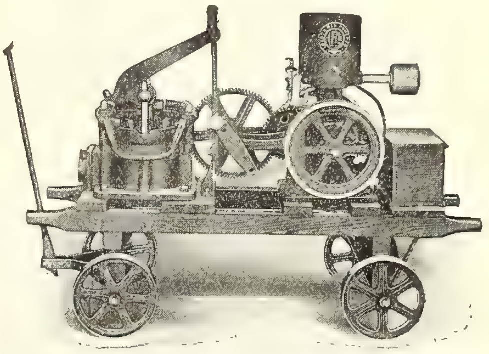
There are Large Profits in the manufacture of Cement Drain Tile.
Write for Particulars.

Over 600 London Concrete Mixers sold in Canada in Three Years.



Variety Woodworker

No Contractor can afford to be without a Variety Woodworker



Diaphram Pump with Power

We manufacture a complete line of Contractors' Machinery: Concrete Mixers, Hoisting Engines, All kinds of Pumps, Block Machines, Brick Machines, Tile Moulds, Derricks, Cars, Ornamental Moulds, Wheel Barrows, Carts, Scrapers and Cement Working Tools.

London Concrete Machinery Co., Limited

Head Office and Factory: Cabell St. and Kitchener Ave., London, Ont.

BRANCHES:

WINNIPEG (445 Main St.) W. H. Rosevear, Mgr.
CALGARY (622 9th Ave. W.) P. D. McLaren, Mgr.
TORONTO (60 Richmond St. E.) F. D. Emsley, Mgr.

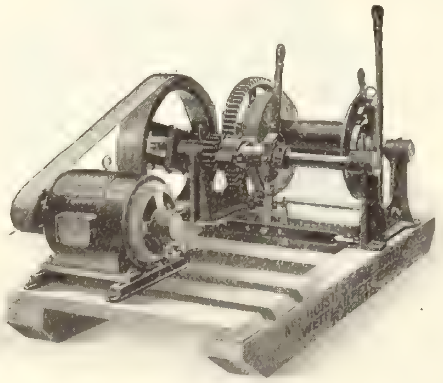
AGENCIES:

VANCOUVER, B. C. Equipment Co.
MOOSE JAW, Sask. Bridge & Iron Co., Ltd.
REGINA, H. A. Knight
FORT WILLIAM, Northern Eng. & Supply Co.
MONTREAL, Foss & Hill Mach. Co.
QUEBEC, A. D. Masson

We are the Largest Manufacturers of Concrete Machinery in Canada.

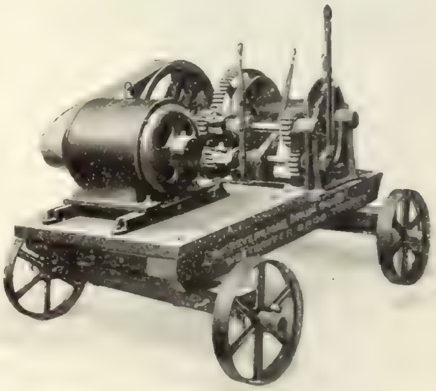
One of the Newest in the Wettlaufer Line

The Wettlaufer Heart Shape Stationary DRUM MIXER with Automatic lift makes it possible for the contractor to increase his capacity without increasing his labor. One demonstration will convince you of its merits.



Single drum motor driven Wettlaufer Hoist

TWO VERY EFFICIENT HOISTS



Reversible single drum motor driven Wettlaufer Hoist on trucks

The Wettlaufer Line of Heartshape Mixers is the Most Complete in Canada

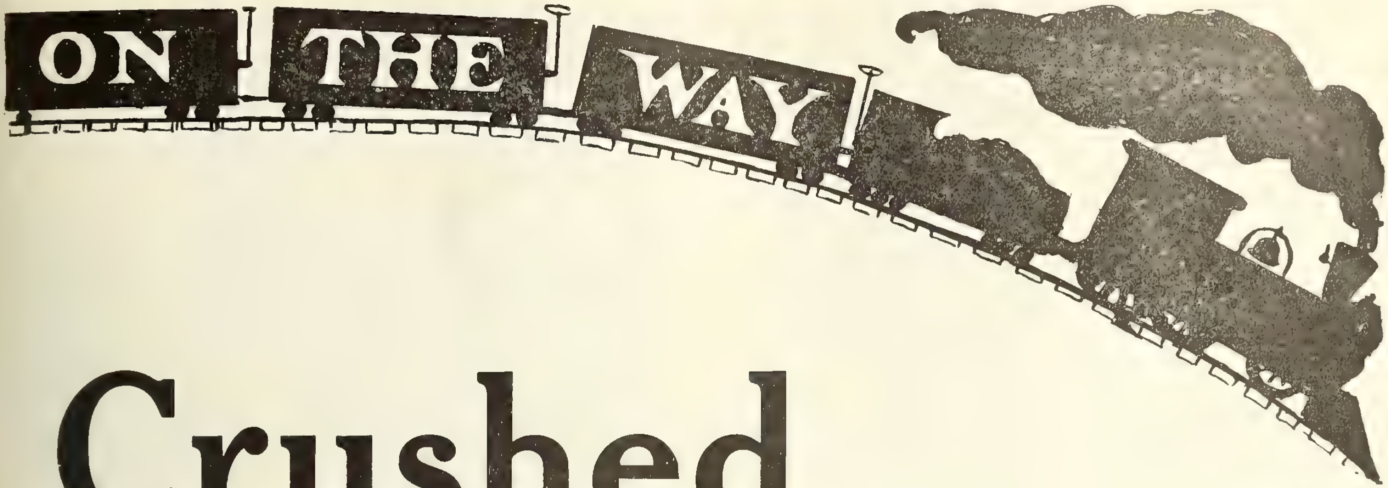
Wettlaufer Bros.

178 Spadina Ave., Toronto, Ont.

Factories: Mitchell, Ont., Buffalo, N. Y., Detroit, Mich.

AGENCIES:

A.E. Hodgert, Regina, Sask. Maysmith & Lowe, 1057 Mears St., Victoria, B.C. A.R. Williams Machinery Co., 15 Dock St., St. John, N.B. The Canadian British Engineering Co., Ltd., 324 Smith St., Winnipeg, Man. R.F. Mancill, 117 10 Ave. East, Calgary. The Hallman Machinery Co., 374 Alexander St., Vancouver, B.C. J. L. Lachance, Ltd., 363 St. Paul St., Quebec. Wettlaufer Bros. 316 Lagauchetiere St. W., Montreal



Crushed Stone

If you want crushed stone in a big hurry come to us and you will get it.

Our bins are always loaded to the top with stone of all grades and shipments can be made the day your order is received.

Quarries located at Dundas and Vinemount.

Portland Cement

Our several cement mills are located at various points that enable us to make prompt shipments with short hauls.

Send us your next order.

Alfred Rogers

Limited

28 King St. West, Toronto

CLASSIFIED INDEX TO ADVERTISEMENTS—CONTINUED

- **Ice-making Machinery**
  - Linde British Refrigeration Co.
- **Insulating Compounds**
  - Canadian Mineral Rubber Co.
  - Standard Underground Cable Co. of Canada, Limited.
- **Interior Finish and Doors**
  - Batts Limited
  - Canada Office & School Fur. Co.
  - Rhodes Curry & Co.
- **Kilns**
  - Canadian Buffalo Forge Co.
  - Sheldons Limited.
  - Sturtevant Co. of Can. Ltd., B. F.
  - Canadian Sirocco Co.
  - Berg Machinery Mfg. Co.
- **Lime**
  - Jamieson Lime Co.
  - Ontario Lime Co., Ltd.
- **Lime Kilns**
  - Improved Equipment Co.
- **Locomotives**
  - Buffalo Pitts Co.
  - Boving Company of Canada.
  - Canadian Allis-Chalmers, Limited.
  - Montreal Locomotive Works
  - F. H. Hopkins Co.
  - Mussens Limited.
- **Marble**
  - Dominion Marble Co.
  - Missisquoi-Lautz Corporation
- **Metal Lath**
  - Greening Wire Co., B.
  - Metallic Roofing Co.
  - Noble, C. W.
  - Steel & Radiation Ltd.
- **Meters, Electrical**
  - Ferranti Electrical Mfg. Co.
  - Can. General Electric Co.
- **Meters, Water**
  - Hopkins & Co., F. H.
  - McDougal Caledonian Iron Wks
  - Neptune Meter Co.
- **Metal Forms**
  - Hotchkiss Lock Metal Form Co
- **Paints (Bridge and Structural Iron and Pipe Coating)**
  - Canadian Mineral Rubber Co.
  - Dominion Paint Works.
  - Goheen Mfg. Co.
  - Ottawa Paint Co.
- **Paints and Varnishes**
  - Dominion Paint Works.
  - Goheen Mfg. Co.
  - Pinchin, Johnson & Co.
- **Paving and Paving Materials**
  - Dominion Creosoting Company.
  - Ontario Asphalt Block Co.
  - Paterson Mfg. Co., B.
  - Asphalt & Supply Co.
  - Barber Asphalt Paving Co.
- **Perforated Metals**
  - Canada Wire & Iron Goods Co.
  - Greening Wire Co., B.
- **Pipe (Concrete, Iron and Wood)**
  - American Spiral Pipe Works.
  - Canadian Allis-Chalmers, Limited.
  - Canadian Pipe Co.
  - Dominion Concrete Co.
  - Dominion Wood Pipe Co.
  - Gartshore-Thomson Pipe Co.
  - Munderloh & Co.
  - National Iron Works.
  - National Pipe & Foundry Co.
  - Pacific Coast Pipe Co.
  - Pedlar People.
  - Piggott & Co., Thos.
  - United States Cast Iron Pipe & Foundry Company.
  - Walsh Plate & Structural Works
- **Pile Driving Machinery**
  - American Hoist & Derrick Co.
  - Browning Engineering Co.
  - Canadian Ingersoll-Rand Co.
  - Lecky & Collis.
- **Pipe Fittings and Flanges**
  - Pittsburgh Valve, Foundry & Construction Company.
- **Planing Mill Exhausters**
  - Canadian Buffalo Forge Co.
  - Sheldons Limited.
  - Canadian Sirocco Co.
- **Plug Drillers**
  - Canadian Ingersoll-Rand Co.
- **Plaster**
  - Alabastine Company.
  - Albert Mfg. Company.
  - Britnell & Company.
  - Crown Gypsum Company.
  - Ontario Lime Co., Ltd.
- **Plumbers' Supplies**
  - Standard Ideal Company .
- **Pneumatic Machinery**
  - Canadian Ingersoll-Rand Co.
- **Portable Saws**
  - C. H. & E. Mfg. Co.
  - Canadian Fairbanks-Morse Co.
- **Portable Track**
  - Bechtels Limited
- **Power Engines**
  - Inglis Company, John.
  - Jenckes Machine Company.
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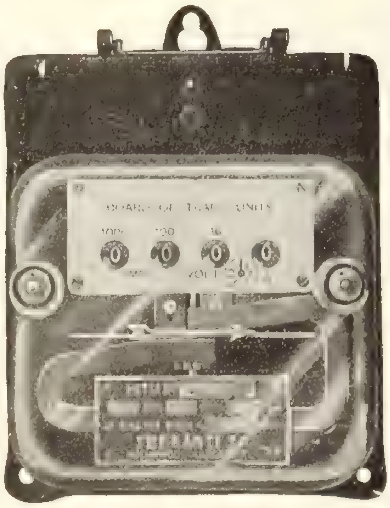

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can be dumped and righted by fewer men and in less time than required for the same operation on many other cars

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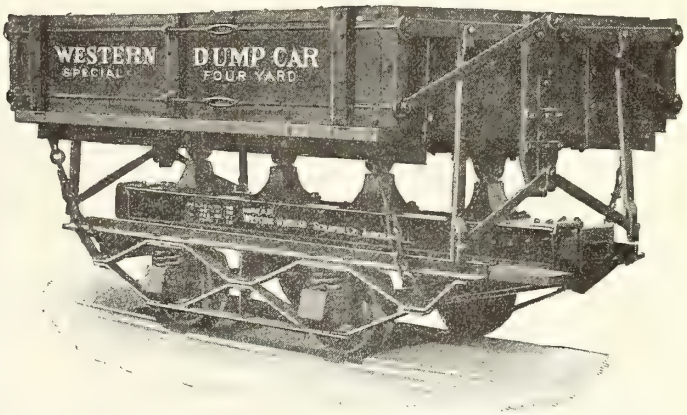

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The Toughest Stone for Macadam in Ontario

Record of Logan Avenue, Toronto, Macadamized from Queen St. to Gerrard St., in 1902

Length 2,454 Lin. Ft. Width 24 Lin. Ft. 6,550 Sq. Yds.

COST FOR REPAIRS

1903	$ 0.00	1908	$ 93.26
1904	3.30	1909	200.46
1905	9.35	1910	14.07
1906	37.33	1911	2.29
1907	16.11		

Total $376.17 or 5⅔c. per sq. yd. for repairs for nine years, a little over 6-10 of 1c. per sq. yd. per year.

Why Not Use Hagersville Stone and Get These Results?

Hagersville Contracting Co.
Hagersville, Ont. Limited

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Prevents Dust—

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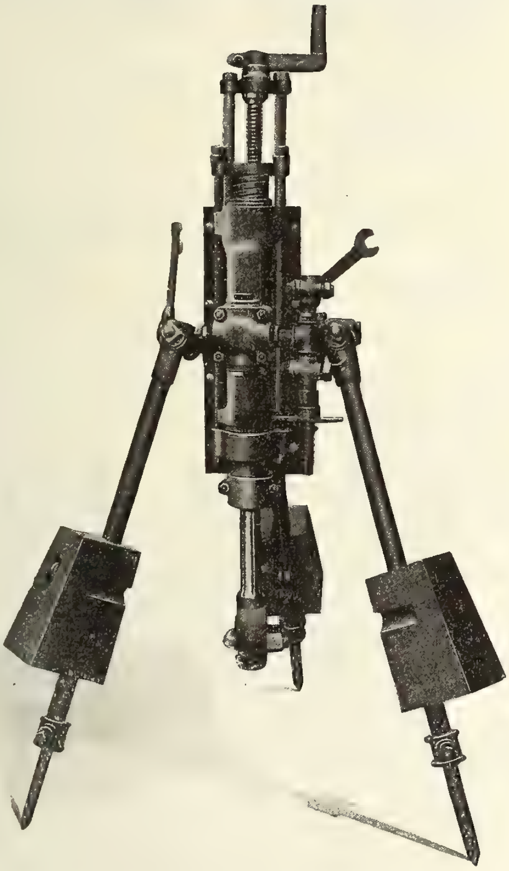

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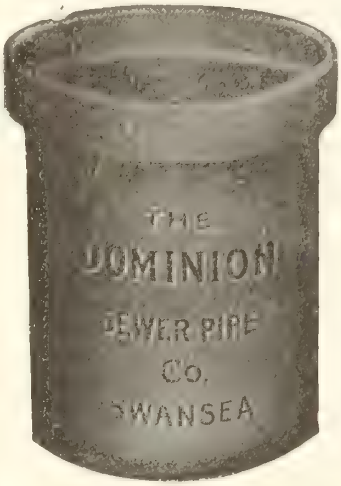

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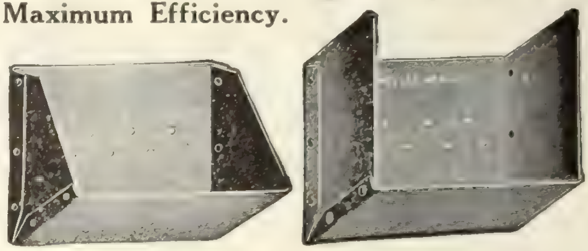

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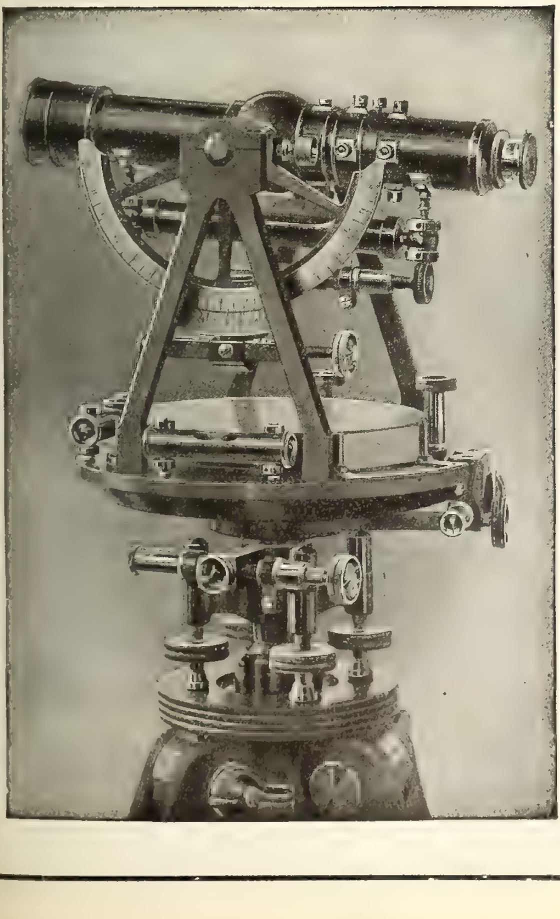

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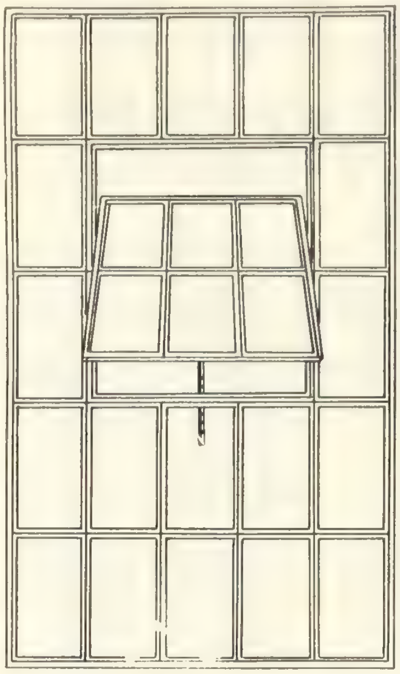

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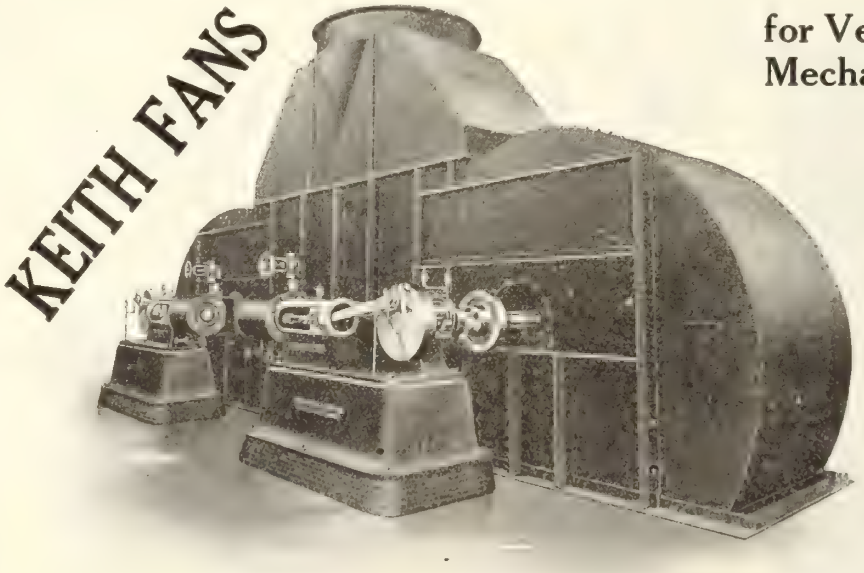

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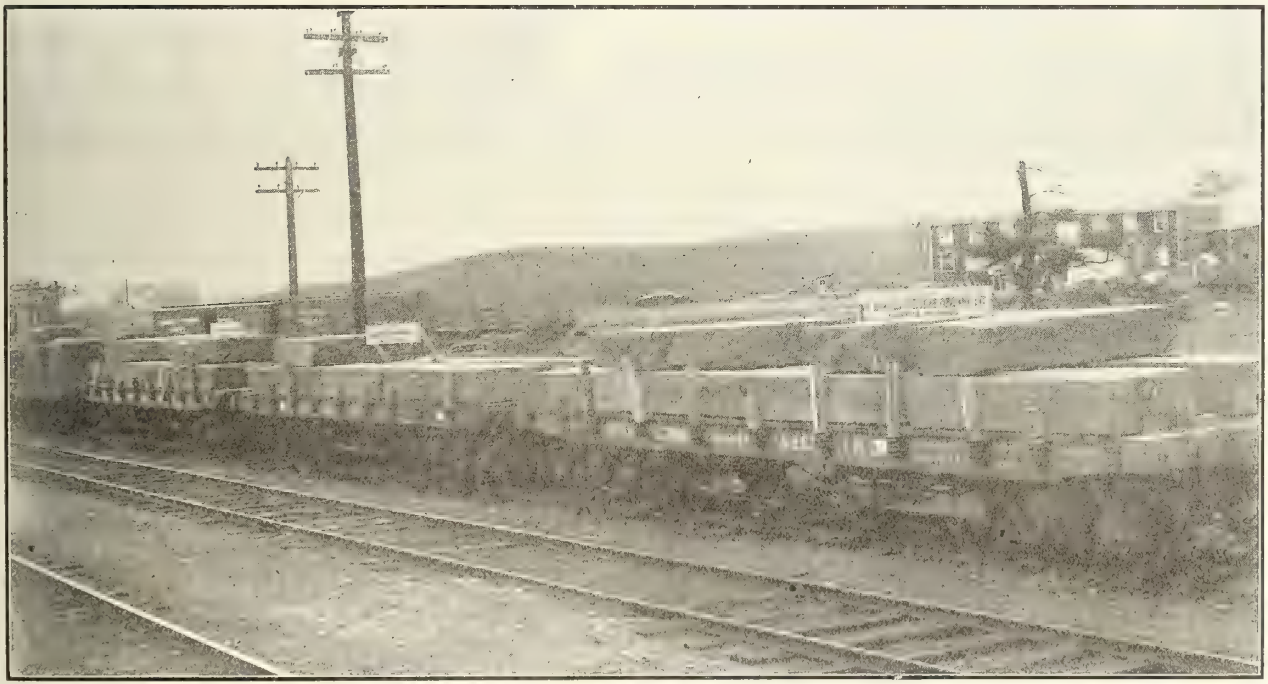

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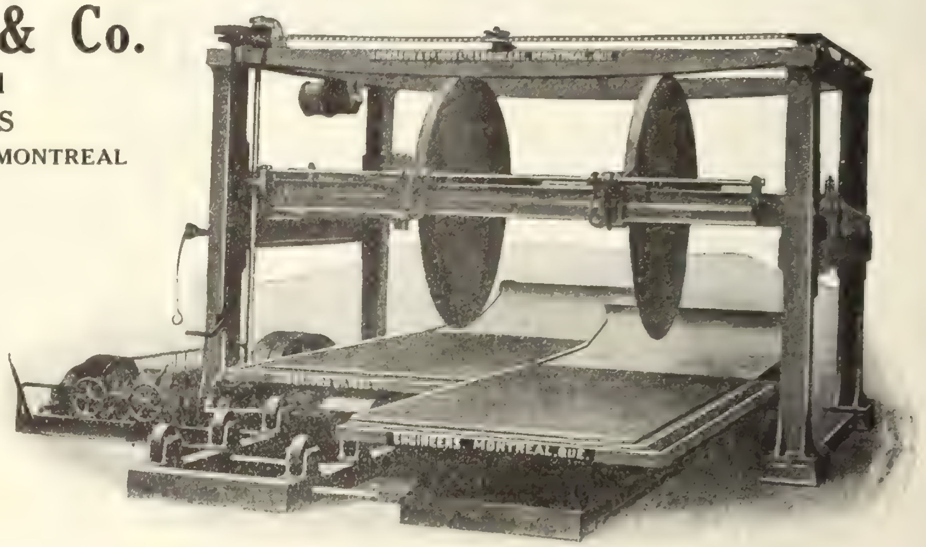

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About 50 of the above Machines at work in Canada

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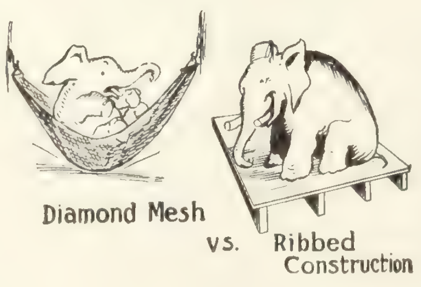

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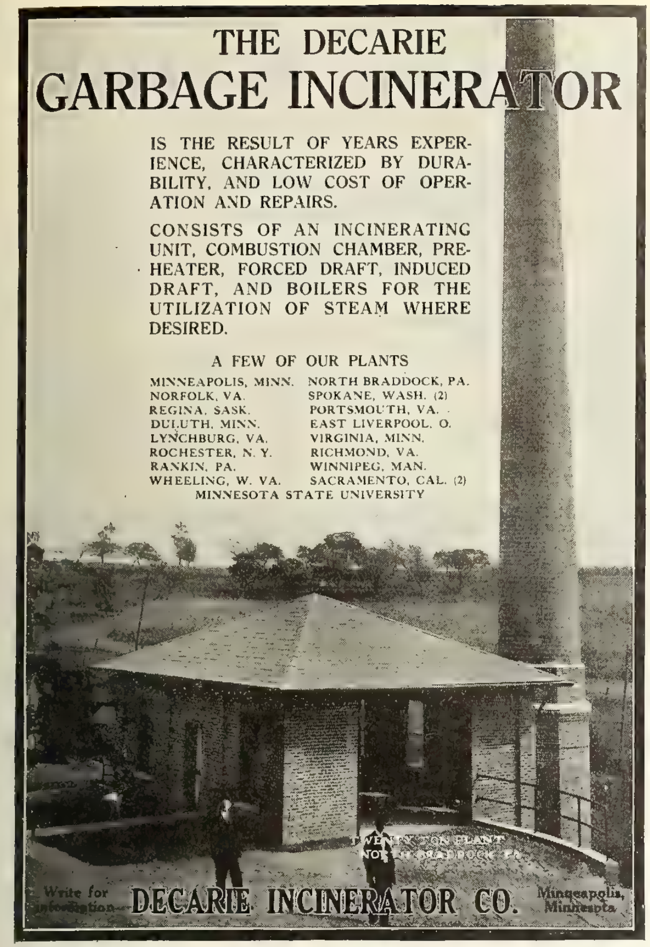

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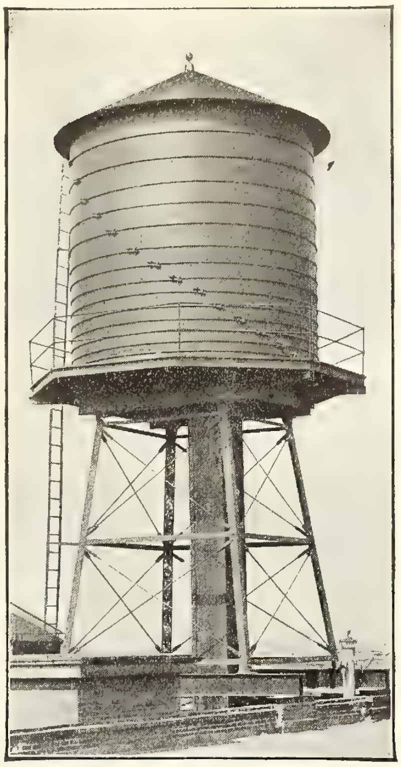

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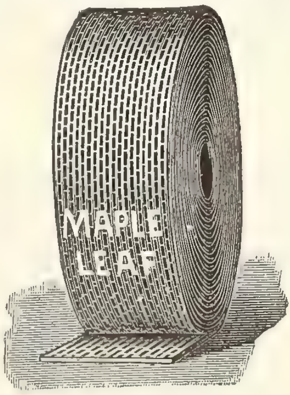

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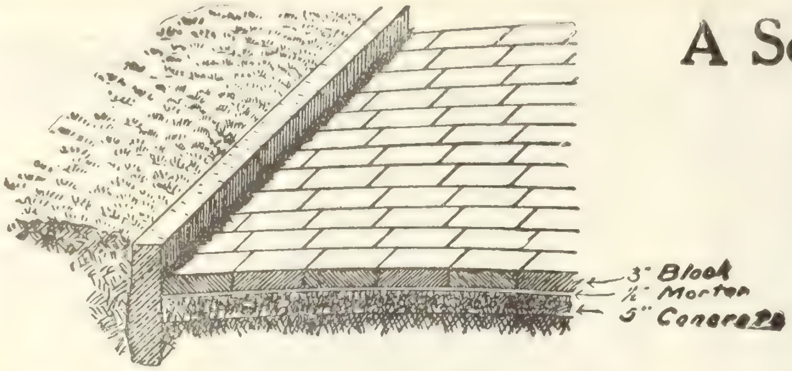

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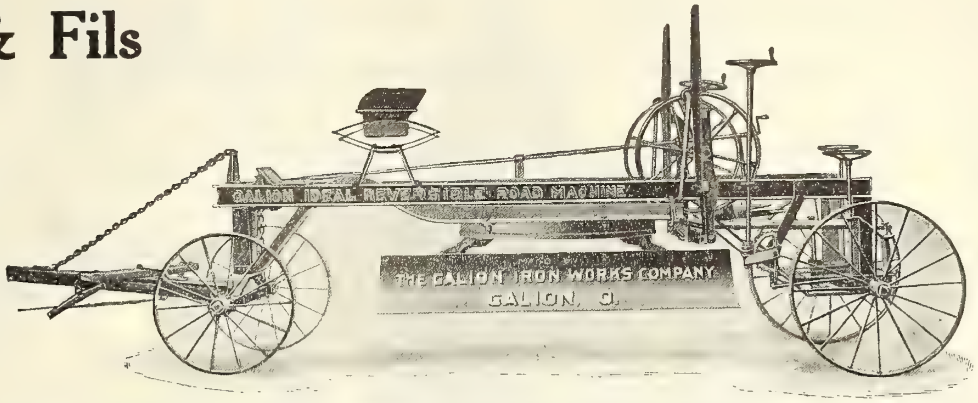
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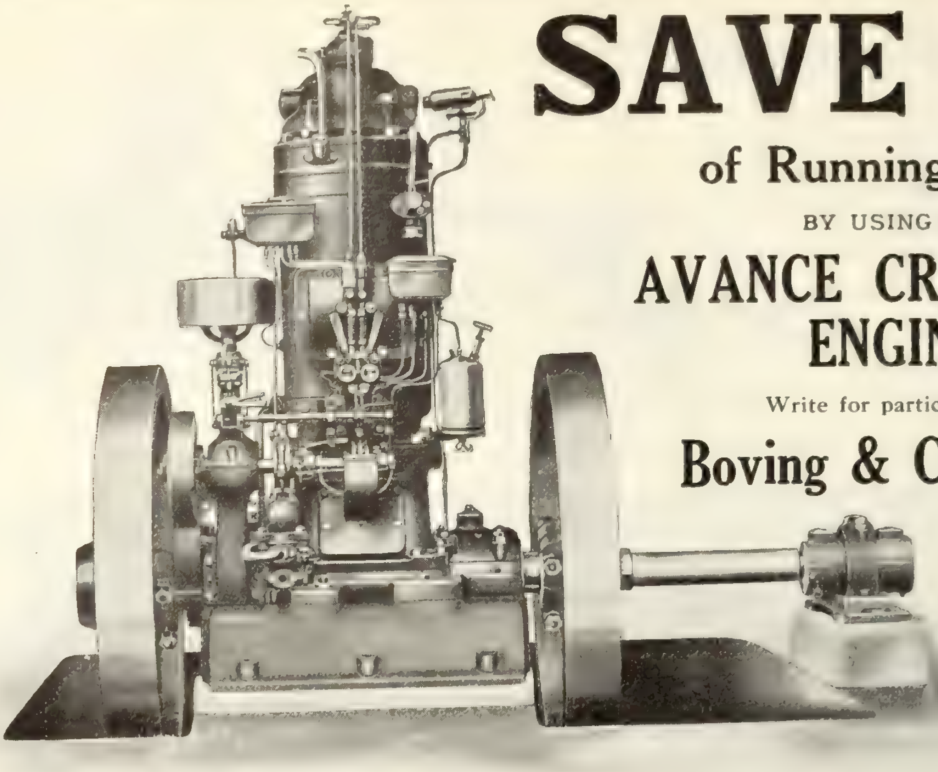

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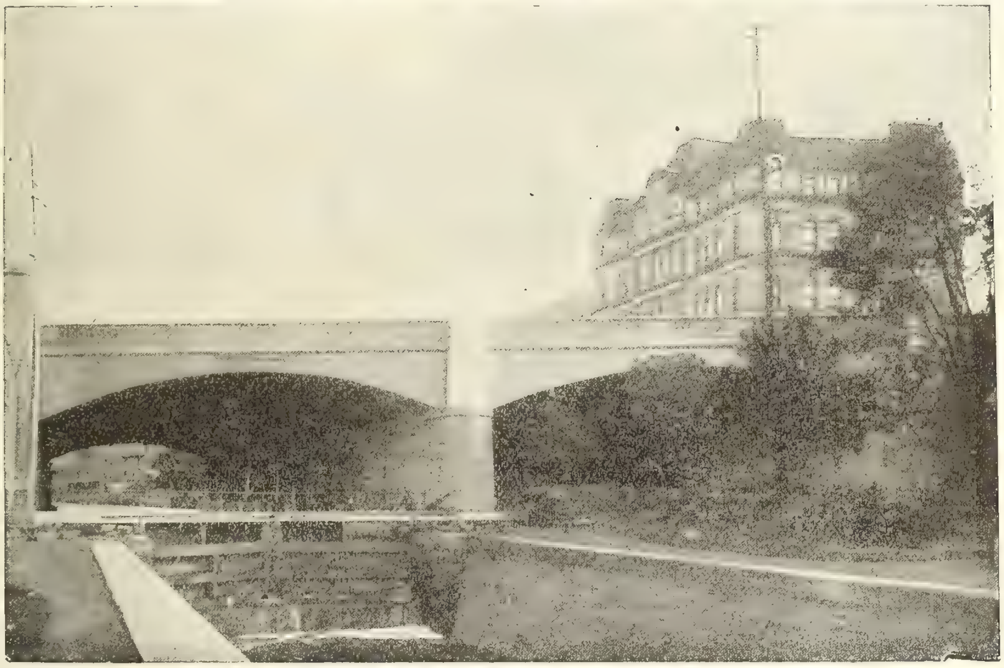

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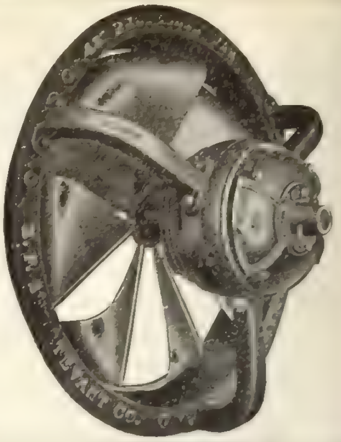

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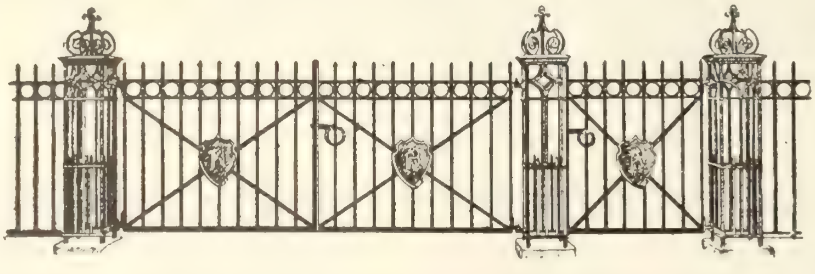

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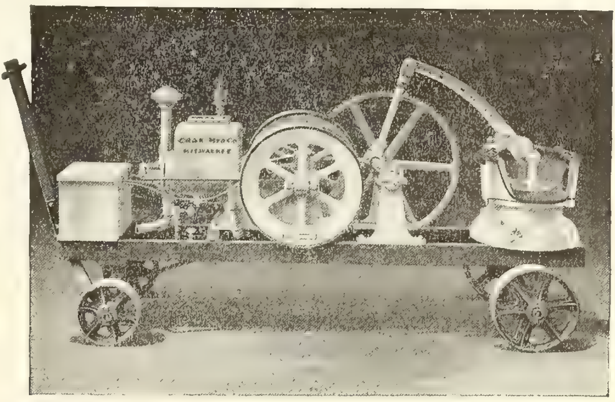

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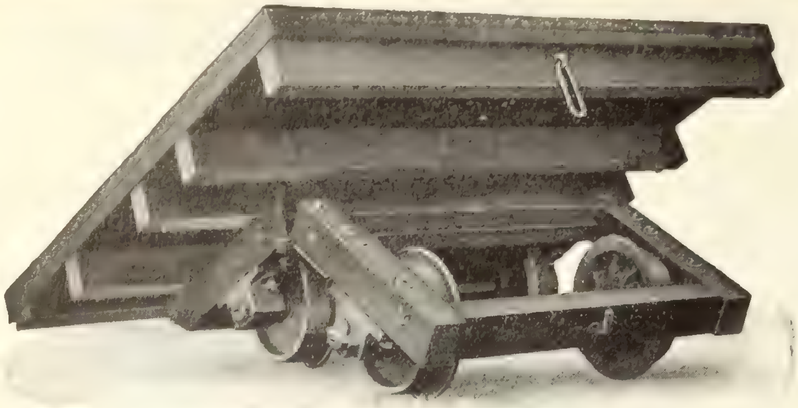

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The features which have been so much admired in these cars is their entire simplicity, strength and quick working qualities. They are used for handling boulders and blasted rock in cuts and elsewhere and being low down they load quickly. Note quick dumping action.. By using our extra side boards they can be used for loose earth also and make a cheap end dump car of 1½ yards capacity. Gauges 30 and 36. We sell them complete, or without platforms, or with frames only.

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By Using a

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The contractor with men and teams cannot compete successfully with the man who owns a THEW SHOVEL.

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The smallest Thew does the work of from twenty to forty men at one-third of the cost. The Thew, being able to load a wagon a minute, will often save enough in team time to pay its entire operating cost, which means that you are loading dirt for practically nothing. Hand labor is difficult to secure, hard to hold and inefficient in practice, while the Thew is always on the job.

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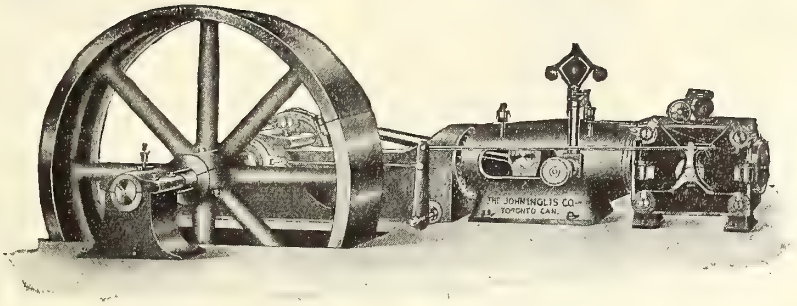
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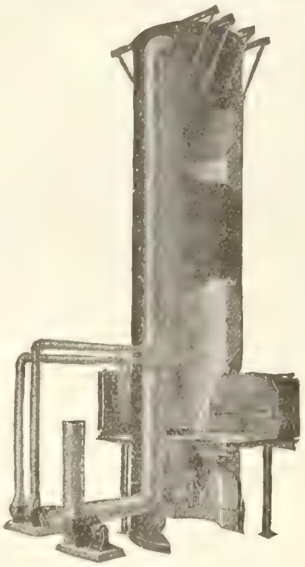

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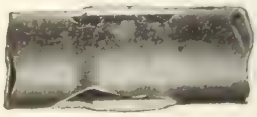

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Eliminates necessity of cinder fill, with proportionate *saving in floor loads.*

Prevents rot in wooden sleepers and floors.

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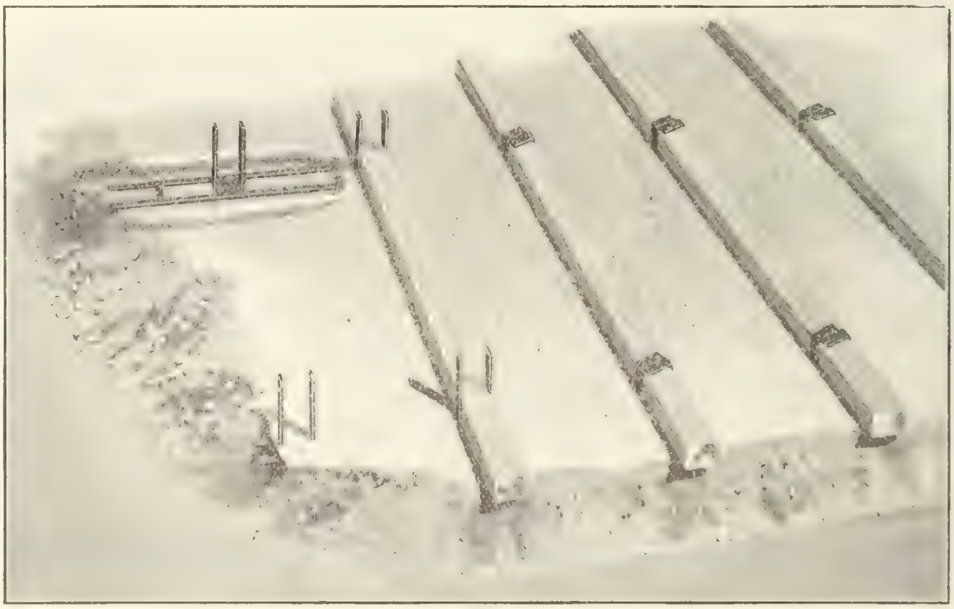

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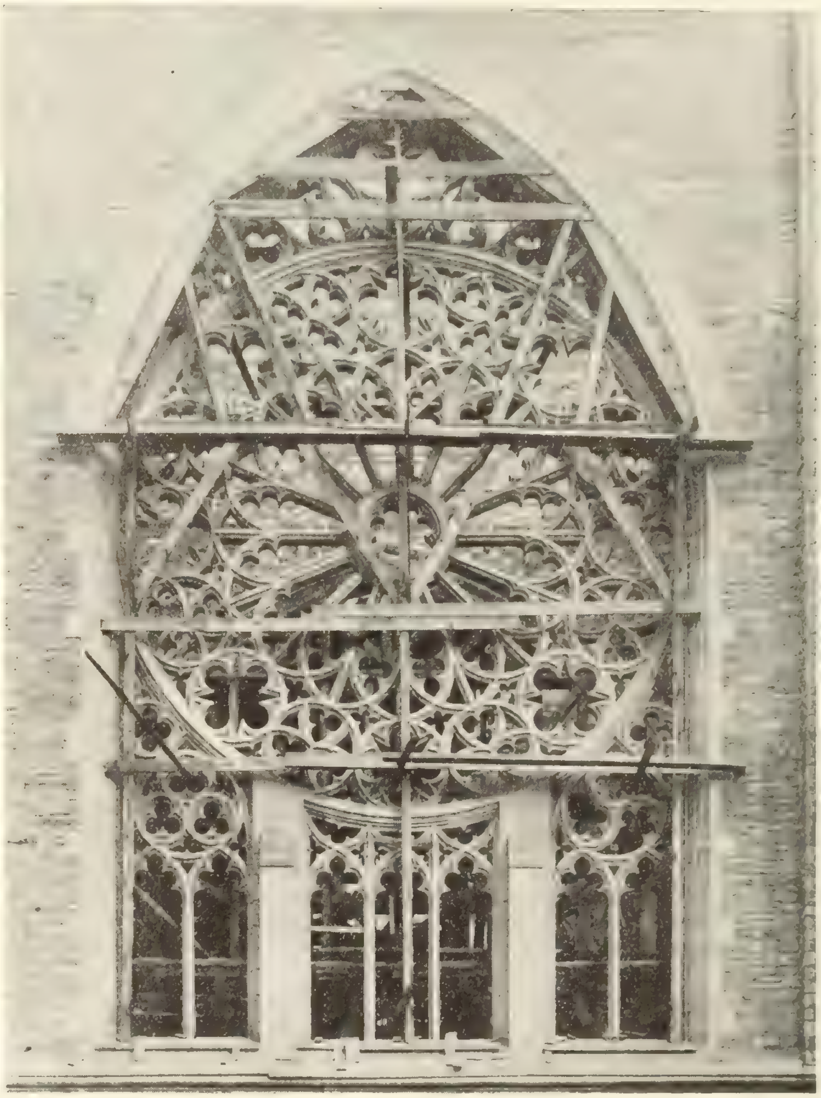

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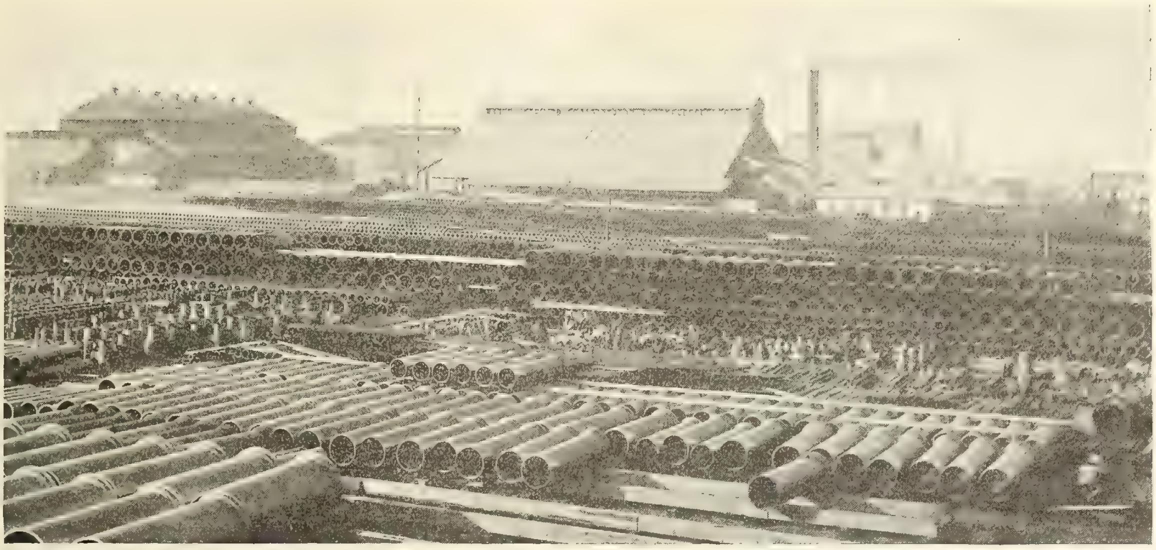

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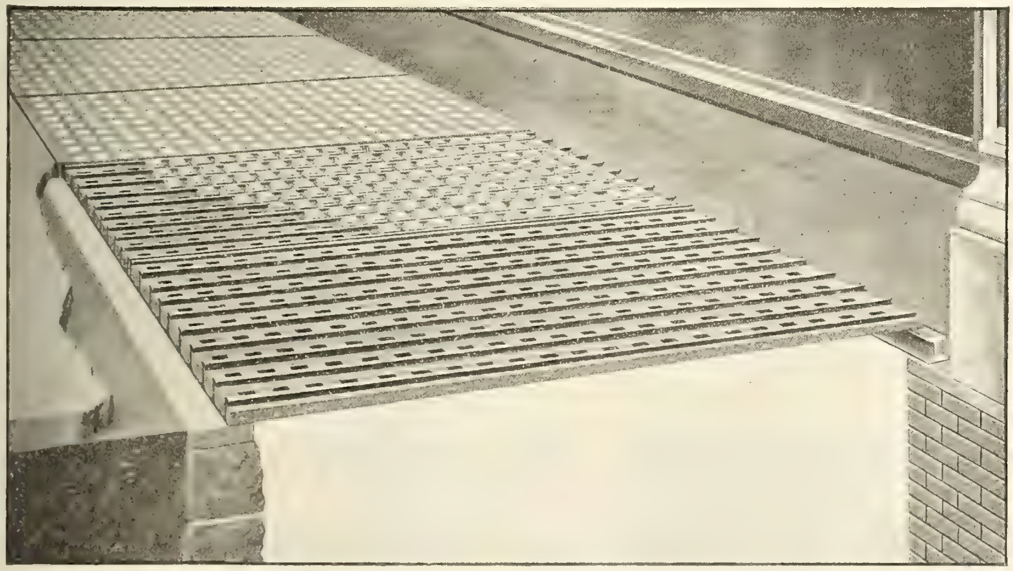

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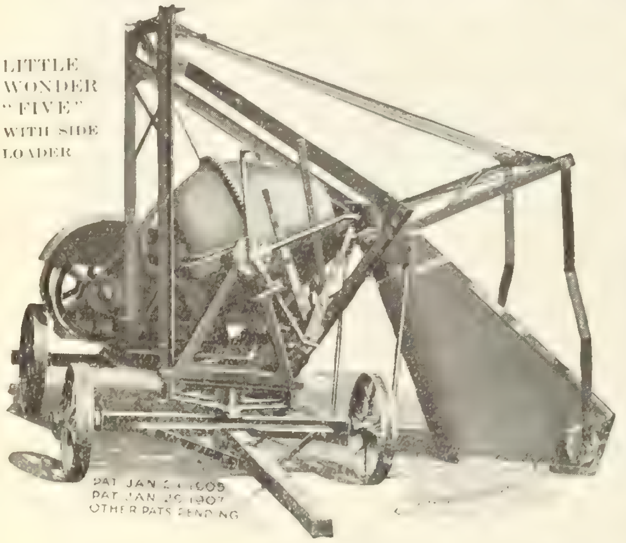

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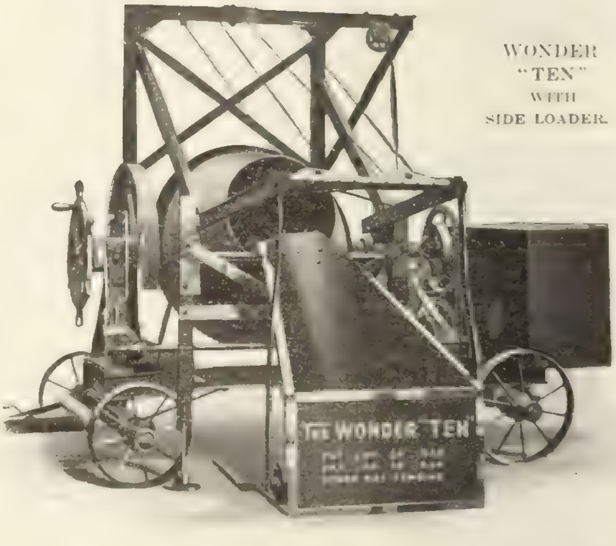

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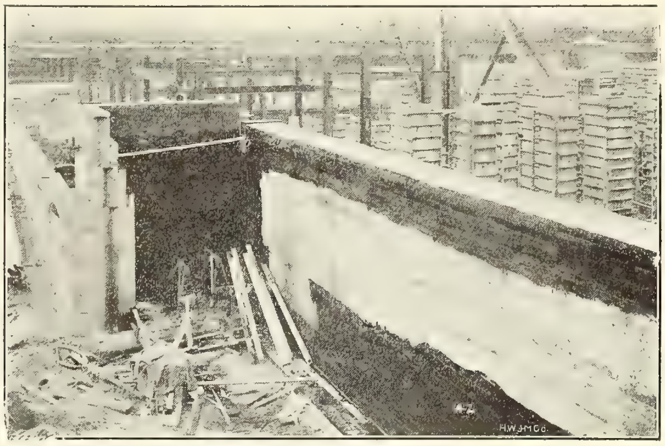

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The Application of Specifications

WITHIN the last few years great changes in engineering and constructional work have taken place. Projects greater in their scope than the past could even dream of are undertaken. New materials are coming into use and old materials are being applied in new capacities. With this development has arisen the need for detailed specifications as to the material to be used, its sizes and strength, method of erection, etc. The address of Mr. Robt. Hunt, president of the American Society for Testing Materials, delivered at the recent annual meeting of that society, contained a number of suggestive thoughts upon this subject.

Four phases of the question were dealt with, the increased need of specifications, the necessity of their being practical, the subject of international specifications and an intelligent application of the specifications to the work done.

It was pointed out that, in the not very remote past, managers were quite indifferent to the details prescribed by their customers. If it suited and amused the customers to formulate such things, well and good, but the manufacturer knew his own product and manufactured it to suit himself. This however involved the element of progress. It was learned that what was adequate for the wants of yesterday was totally inadequate for the wants of to-day; that observation should be made as to the behavior of materials of known composition under certain conditions and circumstances; moreover, that the conditions under which materials were used varied so greatly, that what was satisfactory in one case was unsatisfactory in another. Hence the need for detailed specifications.

With the growth of this feature there is perhaps a tendency to make demands which cannot be fulfilled. Specifications must be kept practical. As an illustration, it was shown that steel without any phosphorous in its composition would be most desirable, but so long as that metal is unattainable what is the use of specifying it? Knowing that the iron ores of the country are adaptable only to certain processes, it seems unwise to expect the engineers of that country to adopt specifications which would leave their own people out of consideration.

The question of an international code of specifications seems hardly advisable for two reasons. The material to be used upon any construction depends upon the products of the country in which the construction is being made and the peculiar needs of the people themselves. Germany is a large producer of iron ores which lend themselves to the Bessemer steel process but two costly failures have proven that the ores of the United States are not adapted to the economic production of such steel. Therefore the United States could not be expected to feel any great interest in international Bessemer steel specifications. In Europe the railways are characterized by light equipment and short lines. Hence they will not require the same character of rails as nations using heavier equipment and longer lines. These two examples serve to prove the difficulty of providing a series of international specifications. However there is a field in which all countries may unite and that is, in the studying and discussion of scientific investigation and of the details of testing materials.

No matter how carefully specifications are formulated they cannot eliminate the necessity for judgment being exercised in their application. Three of the national technical societies of the United States have had committees carefully investigating the steel rail production. The rail committee of the American Railway Engineering Association has gone extensively into the question and its steel rail specifications are accepted as being those of the highest authority. In a recent order for rails those tested fell within the specifications, although showing a considerable number of failures. On consideration it was decided not to ship any of the rails that had been rolled on that order. This seems like a very laudable non-adherence to the specifications. "Such instances do not prove that specifications are without value. They afford an available means of formulating the most advanced state of the art and if drawn according to the best judgment of men familiar with the practical workings of that art, they will be to the highest interest of both the producer and the user."

Highway Improvement in Ontario

THE Provincial Government of Ontario has launched a good roads movement of considerable magnitude. The sum of five million dollars is being expended in northern Ontario for the construction of colonization roadways which must ultimately be of great advantage, not only to new Ontario but also to the province at large.

The second part of the project deals with the roadways of the older part of the province and will involve the expenditure of probably ten million dollars. In order to cope with the question efficiently a commission of experts, consisting of Messrs. Charles A. Magrath, C.E., William A. McLean, C.E., and A. M. Rankin, has been appointed to prepare a report for the Government. They are to investigate and study all matters relating to the construction, maintenance and financing of public highways.

The question presents two phases: first, the construction, and second, the maintenance. The construction should involve at least two kinds of roads. There should be a system of provincial highways connecting the larger urban communities built and maintained by the government as a general public utility. The county and township roads having a more strictly local importance should be built and maintained largely by the locality served. Under the Highways Improvement Act the Government provided one-third of the construction for those counties availing themselves of the provisions of the Act. This ratio seems fair but may have to be increased in order to induce the counties to graple with the problem.

In determining the kind of road to be constructed the question of permanency relative to the amount of traffic must be considered. To construct an unnecessarily good road where there is but little traffic is as lacking in economy as the construction of poor roads where there is heavy traffic.

The question of maintenance of the roads of county and township involves considerable difficulty and a portion of the maintenance will probably have to be borne by the government. The cost embraces not only material but also a force under the guidance of trained men so as to keep the roadways in constant repair. The construction of the county highways will probably be the best educator in teaching that the old system of statute labor in vogue in many places is exceedingly wasteful and in inducing the ratepayers to provide the necessary funds.

The project will call for a large number of especially trained men both in construction and maintenance. How the control of these jointly constructed roads shall be shared by the central government providing a portion of the cost, and a self-governing municipality providing the remainder, will require a good deal of earnest study but doubtless can be made to work with as little friction as the government inspection and assistance of public schools.

Method of Highway Organization

APROPOS of the extensive road work to be undertaken in Ontario a brief explanation of the manner in which state aid and county supervision is worked out in the state of Illinois may be in place. The centre of the road organization for that state is a commission of three men, with a highway engineer and an assistant highway engineer. The commissioners receive an annual salary of $3,500 each and the engineer $4,000 and the assistant engineer $2,500 per annum. Provision is made for the appointment of a county superintendent for each county. In order to secure trained men the county board must submit to the state commission a list of from three to five names. These candidates will be submitted to examination by the State Highway Commission. Those eligible will be reported to the county board and the latter body will appoint one from this approved list. The salary is to be fixed by the county board. The county superintendent will be the deputy of the state highway engineer and will take complete charge of the road and bridge work of the county.

Certain roads of the county are to be known as state-aid roads. The cost of half the improvement will be paid by the state and the other half by the county. In order to obtain the state grant the county must file maps showing what roads are to be state-aid roads and must also take the necessary steps to finance the county's half of the cost of construction.

Editorial Comment

TESTS at the Lawrence experiment station, Mass., indicate that the aeration of sewage by a current blown or drawn through greatly hastens the process of purifying. Filters of the sand-filter type were able to purify efficiently six to eight times as much after aeration as before. In percolating filters the sewage could be handled after aeration three times as fast as before aeration.

* * *

DURING the year 1912, 20,275,120 tons of shipping passed through the Suez canal, an increase of 2,000,000 over 1911. The total receipts were the greatest in the history of the canal and totalled $27,300,000. During the year, 5,373 ships passed through, of which 3,335 carried the British flag.

* * *

IN some parts of Europe, particularly in Germany, the steel railroad tie is coming into use. In the stretch between Berlin and Hamburg where the ties are used the track was of excellent quality both as to surface and alignment. With the light German locomotives the noise was diminished rather than increased.

* * *

THE exhibit of the National Bureau of Standards at the recent Chicago cement show demonstrated the effect of electrolysis on the reinforcing rods of concrete. The moisture and impurities in the concrete set up local currents in the iron by which iron oxide is produced. The oxide occupies a greater volume than the iron and exerts a pressure which eventually cracks the concrete. The amount of pressure was determined by means of a steel cylinder with a bore of 1½ in., in which was fitted a steel rod 1 in. in diameter and the space between was filled with cement. This was immersed in water and the iron core connected to an electric circuit. The expansion of the outer cylinder was measure and it was found that the oxidation of the iron core produced a maximum pressure of 4,700 pounds per square inch.

In view of the inquiry now going on in connection with London's motor traffic, including the question of the motor omnibus, it is of interest to note that, while in 1903 there were 3,500 horse omnibuses plying the streets of the Metropolis, this number has now been reduced to 100, and it is expected that by the beginning of 1914 the horse omnibus will have finally vanished. Mr. Richard Tilling, whose firm started the Tilling omnibuses in the year of the Great Exhibition, has recently stated that "there will not be a single omnibus horse to be seen in London by the end of this year." Old horse omnibuses are now used as bungalows and cricket pavilions.

Bearing Metals and Methods of Testing*

Various Compositions—Friction Test—Temperature Test — Improved Hammer Test — Conclusions

By T. D. Lynch

One does not have to go very far into the study of materials for use in the construction or maintenance of machinery until the question of the proper bearing material is presented. Shall it be made of solid bronze or shall it be made of a bronze or cast-iron shell lined with babbitt? If the latter, what shall the composition of the lining be and how can it be tested?

The discussion following will be confined primarily to the babbitted type of bearing with special reference to the importance of proper heat treatment in order to produce a good babbitt and further to the description of certain tests that have been made in connection with the study of the subject.

The introduction of lined bearings dates back to Sir Isaac Babbitt who first used a composition containing approximately 90 per cent. of tin, the remainder being copper and antimony. This babbitt is sometimes known as "Genuine A-1," and when properly made is tough, hard, has a low melting point, good anti-fractional qualities and is more nearly fool-proof than any other babbitt in use. It has therefore become a valuable standard for the comparison of quality. However, the price of tin has become so high (approximately 50 cents per pound), that the problem of a substitute for the A-1 babbitt has become of great commercial importance; so much so that almost every conceivable formula of tin, lead, antimony, copper, zinc and nickel have been suggested and many of them tried in service as a substitute for the A-1. Some of these have met with success while others have met with very marked failure. This infinite variety of possible compositions, together with varying temperatures and hit-or-miss methods of handling the material has produced innumerable variations in the efficiency of the product.

Both laboratory and service tests have shown that good results may be had with the lead-base as well as the tin-base babbitts, so the problem reduces itself to a study of the conditions necessary to produce certain anti-frictional and mechanical qualities, and of the methods of testing for them.

During recent years we have been conducting a series of tests in the laboratories and works of the Westinghouse Electric & Manufacturing Company, at East Pittsburgh, for the purpose of determining some reliable yet practical test that would indicate the essential qualities and give a check on the materials used and on the method of manufacture, by means of which we may learn why a certain babbitt should be used, how it should be treated, and what it will do when completed and in service.

Friction Testing

The first test was conducted on a well-known friction testing machine, the results of which were not conclusive in that they could not be duplicated from day to day even on the same test sample. The experiences of others were then sought and among them the late Dr. C. B. Dudley was appealed to for a reliable friction test. He replied that he had tried all known laboratory tests and semblance of tests, to be convinced that only the service test could so far be relied upon.

We next turned our attention to a practical service test on motors operating under severe shop conditions. Ten motors were selected for the test. They were of varied sizes but all had cast-iron shells lined with tin-base babbitt metal. The bearings were all replaced with other bearings lined with the lead-base metal carefully and properly made. In every case the lead-base lining stood up as well and in some cases better than the tin-base lining—the severe conditions under which they were operating remaining the same.

This test was so satisfactory and apparently so conclusive that the lead-base metal was adopted for the bearings of a certain line of motors and accordingly manufacturing was begun under normal shop supervision, but very soon bearing troubles were reported from the test floor. Some of the relatively few bearings which gave trouble were brittle while others were soft and wiped out. The existence of these opposing characteristics of failure in a few bearings, in spite of the good results found in a large majority of the bearings on test as well as under normal service conditions, gave us much concern, and the difficulties encountered shattered the faith so far placed in the lead-base metal, because it was not entirely clear as to what had caused the occasional failure.

In order to determine the underlying causes for these varied characteristics a test to destruction was planned. With this object in view a test bearing was made from a lead-base metal but under careful supervision; each bearing was measured accurately, each set of measurements including five diameters equally spaced at each end and at the middle of the bearing. The bearings were then mounted in a test motor. A 265-lb. weight was mounted eccentrically on the pulley end of the shaft. The motor was run at speeds increased by easy steps until the limit of the motor frame was exceeded and the frame destroyed; yet the bearing remained in good condition.

A second test was planned using the same bearing and a 25 h.p. motor. This motor was back-geared to a counter shaft to which in turn was coupled an arm driving an eccentric weighing 750 lb., thus producing a shock similar to the effect found in the operation of a rock crusher. A generator was belted to the same counter shaft in order to load the motor in the test. The motor was run light for several days with shock effect only. It was then loaded by steps until an excessive overload was reacher, which in addition to the continual shock caused by the eccentric produced a condition much more severe than is allowable even in extreme practice. Yet with all this the bearing remained in good condition and check measurements showed negligible wear.

In this connection it may be well to state that there is a distinct difference between bearing metal and bearings because bearing troubles may be due to many causes not inherent in the metal—such as defective alignment, improper lubrication, insufficient clearance, sand in oil, abnormal belt pull, etc., all of which must be considered separately from the bearing metal itself.

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*Before the American Society for Testing Materials.

The Brinell Test

No definite measure of quality could be deducted nor conclusions drawn from the above tests, therefore other tests were sought which would give a measure of comparative value. The Brinell test was next tried as follows: a 500-kg. weight on a ball 10 mm. in diameter for a period of 30 seconds was used. The sample was poured into an open steel mold 2 in. in diameter by ⅝ in. deep, previously heated to about 150 deg. C. Before making the impressions the specimens were faced off, removing just enough metal to even up the two flat surfaces. The Brinell test was then made on the bottom end of the specimen at three equally spaced points on a circle one-half the radial distance from the center. An average of the three readings was recorded as the hardness of the metal. A Brinell hardness numeral of 30 for tin-base and 23.5 for lead-base metal was found to give most excellent results, other things being normal; but this test did not reveal the whole story, since it failed to differentiate between toughness and brittleness.

Hammer Test

A further test was found to be necessary in order to detect and study these two characteristics, so a hammer test was devised which has shown results that indicate the qualities of the babbitt more clearly and definitely than any other quick test. The test specimen if soft peens out, if brittle it breaks, while if soft and brittle it peens out and crumbles.

This test resembles the most severe service conditions with the wiping action left out and is introduced here as worthy of the most careful consideration, and the many tests made have proven it to be extremely useful in giving a measure of brittleness and toughness. When used in combination with the Brinell test we have no difficulty in detecting defective babbitt metals.

A series of hammer tests was inaugurated with special reference to the comparative qualities of the lead-base and the tin-base metals. These tests included a great variety of heat treatments and methods of handling the metal and their results emphasized the favorable possibilities of the lead-base metal, but also showed clearly that the temperature of both the smelting and pouring of the metal must be kept within narrow limits.

The samples for test were made as follows:

The metal was poured into a metal mold producing a rough casting 1¼ in. in diameter by 5-16 in. thick, which was then turned to 1 in. in diameter by ¼ in. thick. The turned sample was placed on the anvil of the testing device and the hammer set in motion. Readings were taken at frequent intervals, observing thickness of sample and number of strokes, from which curves were plotted.

Samples were taken from the kettles where the different alloys were being smelted, from stock ingots remelted in a hand ladle and from various babbitting pots. A careful record was made of all conditions that might affect later results, including the temperature and general condition of the metal, as well as the temperature of the molds into which they were poured. The results of the tests on these samples demonstrated clearly that some were hard and brittle, some soft and brittle and others soft and plastic, while still others were hard and tough. The tin-base samples showed much less variation than the lead-base although some of the very best results obtained were from the lead-base metal. These observations and tests further indicated that smelting and pouring temperatures especially of the lead-base metal were of prime importance.

Temperature Tests

The following detail study of the lead-base metal was then made on material known to be of good quality before subjecting it to different temperatures. The samples were 12 in number.

No. 1 was poured at 320 deg. C. The metal showed a granular and brittle condition due to having been poured too cold.

No. 2 was poured at 700 deg. C. The unstable character of this sample was due to having been poured too hot.

No. 3 was heated to 700 deg. C., allowed to become cold, then reheated to a similar temperature many times and finally reheated and poured at 460 deg. C. This sample was also unstable due to repeated overheating, even though poured at a proper temperature.

No. 4 was heated at 550 deg. C. and allowed to become cold, then reheated to a similar temperature many times and finally reheated to about 490 deg. C. and poured. It showed a brittleness due to repeated overheating, even though the temperature was only slightly higher than that necessary for the pouring of good bearings.

No. 5 was heated to 700 deg. C. and cooled to 400 deg. C. before pouring. It was softened as the result of the single over-heating.

Nos. 6 and 7 were poured at 360 deg. C. Both shewed a decided improvement over No. 1 but were poured at too low a temperature to produce the proper hardness and toughness necessary for a good bearing.

No. 8 was heated quickly to 600 deg. C. and poured at once. Very little damage was done by the one overheating.

No. 9 was heated similarly to 600 deg. C. but cooled to 460 deg. C. before pouring. Better shaped curves were produced than in No. 8.

Nos. 10 and 11 were poured at 480 deg. C. and No. 12 was poured at 460 deg. C.; all were hard and tough giving curves characteristic of a good babbitt.

A large number of tests were also made on babbitts of a great variety of composition for the purpose of comparison. No babbitt tested gave better curves than those made from the lead-base metal when carefully and properly made, thus demonstrating the possibilities of the lead-base metal.

This series of tests was so conclusive as to the importance of temperature limitations that a temperature regulator was designed and installed on each babbitting pot. These regulators were so adjusted and safeguarded as to render it impossible for the temperature of the babbitt in the pot to exceed a fixed limit.

It has been found to be entirely practical to automatically regulate the temperature of the metal in the pot so that the variation from a fixed point need not be more than plus or minus 10 deg. C., and this variation is well within the range of safety for the lead-base as well as the tin-base metal.

The hammer testing device proved so interesting and instructive that an improved drop-hammer was designed and built. This hammer has a stroke of 1¾ ft. lb., and requires only about five per cent. of the number of strokes, and a correspondingly shorter length of time for the test than was required on the first device. All of the more recent tests including the following have been made under the new hammer, and represent a few of a long series of tests made in connection with commercial work with special reference to the following features: raw material used, smelting and refining in the crucible or kettle, Brinell hardness of standard samples of the ingot as poured, remelting and pouring temperatures at the babbitting pot, temperatures of the shells into which the metal is poured, Brinell tests and hammer tests taken from the babbitting pots at frequent intervals, and to a limited extent the microscopic structure of babbitt known to be good as well as that known to be defective.

Conclusions

The conclusions drawn as a direct result of these tests, together with a large amount of service experience, may be summarized as follows:

1. The number of compositions of babbitt metals should be as few as possible, preferably one of the tin-base and one of the lead-base and each should be made the best of its class.
2. The constituent metals must be of superior grade, carefully tested and inspected, since the first requisite is a good raw material.
3. The alloying or smelting is of vital importance and must be so done that the high and low-melting-point metals may be properly alloyed far below the melting point of some of the component parts. A temperature of 500 deg. C. and less has been found to be sufficient to obtain satisfactory alloying of babbitt metal. The melted metal should at all times be kept covered with powdered charcoal or other protection from oxidation.
4. Pouring the babbitt too cold tends to produce a granular or coarse crystal formation and pouring it too hot tends to produce a softening effect. The lead-base babbitt is not nearly as fool-proof as the tin-base, and therefore the range of pouring temperature is more limited. However, a pouring temperature of 460 deg. C. (450 deg. to 470 deg. C.) for both lead-base and tin-base babbitts has been found to give most excellent results.
5. Heating the shell to 100 deg. to 150 deg. C. before the babbitt is poured into it tends to prevent blow-holes and similar defects and also prevents the lining from shrinking away from the shell.
6. Babbitted bearings must not be jarred while the metal is solidifying since any disturbance at this temperature tends to enlargement of the crystals and corresponding brittleness.
7. The matrix of the lining metal should be just stiff enough to support the hard crystals. These hard crystals should be as numerous as possible and yet not lie on each other to cause brittleness.
8. A Brinell hardness of 23.5 for lead-base and 30 for tin-base babbitts has been found to give most excellent results.

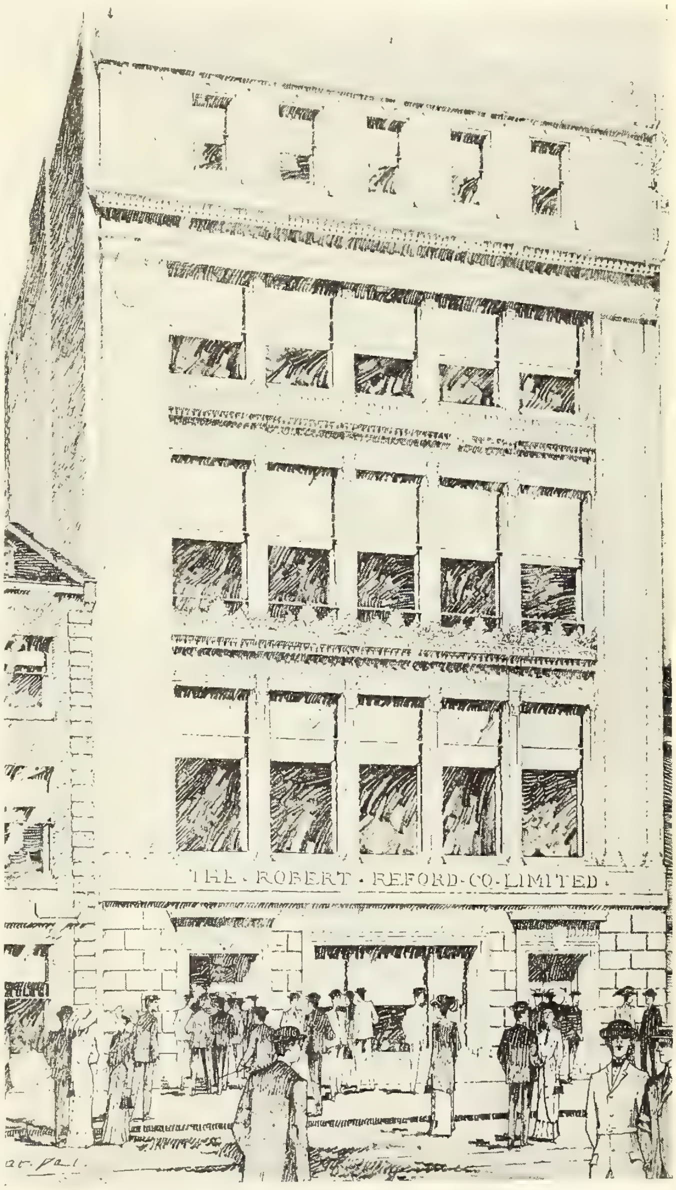
These tests and suggestions are offered simply as a study to be furthered by those interested in applying babbitted bearings to their several service conditions; and while no final decision can be reached as the result of these tests, they certainly do emphasize the great importance of working closely to given compositions, and of following definite processes checked by chemical tests, Brinell tests, hammer tests, careful supervision, and finally by the court of last resort, service.

A Chinese student of mechanical engineering at Massachusetts Institute of Technology, is experimenting with Chinese bamboo for concrete reinforcement purposes, having had a quantity shipped to him from his native land. Bamboo is the standard building material of many tropical countries and is widely used also in China.

New Building for Robert Reford Company, Montreal

From designs by Messrs. Ross and Macdonald, Montreal, the Peter Lyall Construction Company have commenced the construction of an office building of four storeys and a basement for the Robert Reford Company, shipping agents, Montreal.

The new building will be partly on the site of the present structure, and will extend the full depth of the property, with elevations on both Hospital and St. Sacrament streets. Separate entrances have been provided, each remote from the other, for the saloon and steerage passengers. The general office will occupy a large area in the centre of the building; this room will be one of the finest in the city in its location, lighting, architectural treatment, and area. The site is 180 by 40. The foundations will be of concrete, with a base of granite, the remainder of the exterior being of grey limestone. The frame of the building will be of concrete. A large quantity of marble will be utilized in finishing the hall. The rooms will be finished in stone, marble and white quartered oak.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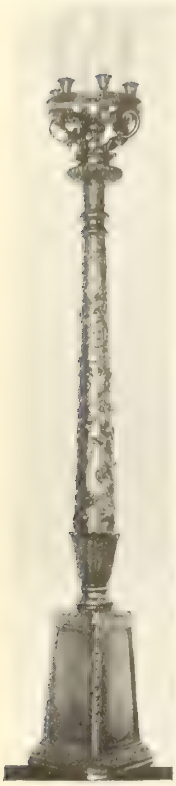


Fig. 1

IN the issue of the Contract Record of April 10th, 1912, was published a description of the constructional features and exterior detail of the new general offices of the Bank of Toronto, at that time in the process of building in the city of Toronto. Since then the work has been pushed to completion and as the interior appointments and equipment involve a number of extremely interesting features, we publish in this issue a description of the chief points of interest to be found in the interior arrangement and business facilities of the institution.

The new Bank of Toronto building, with its beautifully pillared walls, situated at the corner of Bay and King streets, Toronto, conveys to the sense of sight the very idea that the word bank should convey to the mind—strength and solidity. The exterior is of the lightest pink Tennesse marble, which against the winter snow inspires a sense of warmth. The building is one of the most attractive in the city. The material of which it is constructed, its beautiful Corinthian columns and the wealth of sculpture work challenges and holds the attention. The sculpture ornamentation was designed by the architects, modelled by L. Tonnetti, Neumann & Even, of New York, and carved by Ardolino Bros., Toronto, and, while there is much of it, one never feels that it is overdone.

The institution stands as every building of a public character should stand, a monument of the architectural and constructional skill of the day in which it was built. It was designed by the architects, Messrs. Carrere, Hastings and Eustace G. Bird, of Toronto. The power plant was laid out by the same architects with Messrs. Clark and McMullen and Riley as consulting engineers.

INTERIOR STRUCTURAL DETAILS

Just as in the exterior plan the architects have striven to make the building suggestive of the purpose for which it is intended, so in the interior they have consciously striven after a certain effect and have been most successful in the accomplishment of that object. As one passes into the rotunda, there comes a sense of restfulness; in some intangible way there is conveyed to the mind a consciousness that numerous elements have been wrought into harmonious unity, without a single discordant color tone.

The block, which constitutes the general offices of the Bank of Toronto, is of six storeys, four above the ground floor, with basement and sub-basement. There are two entrances, the Bay street and the King street, the latter being the main entrance. On going into the building from King street, one passes through the

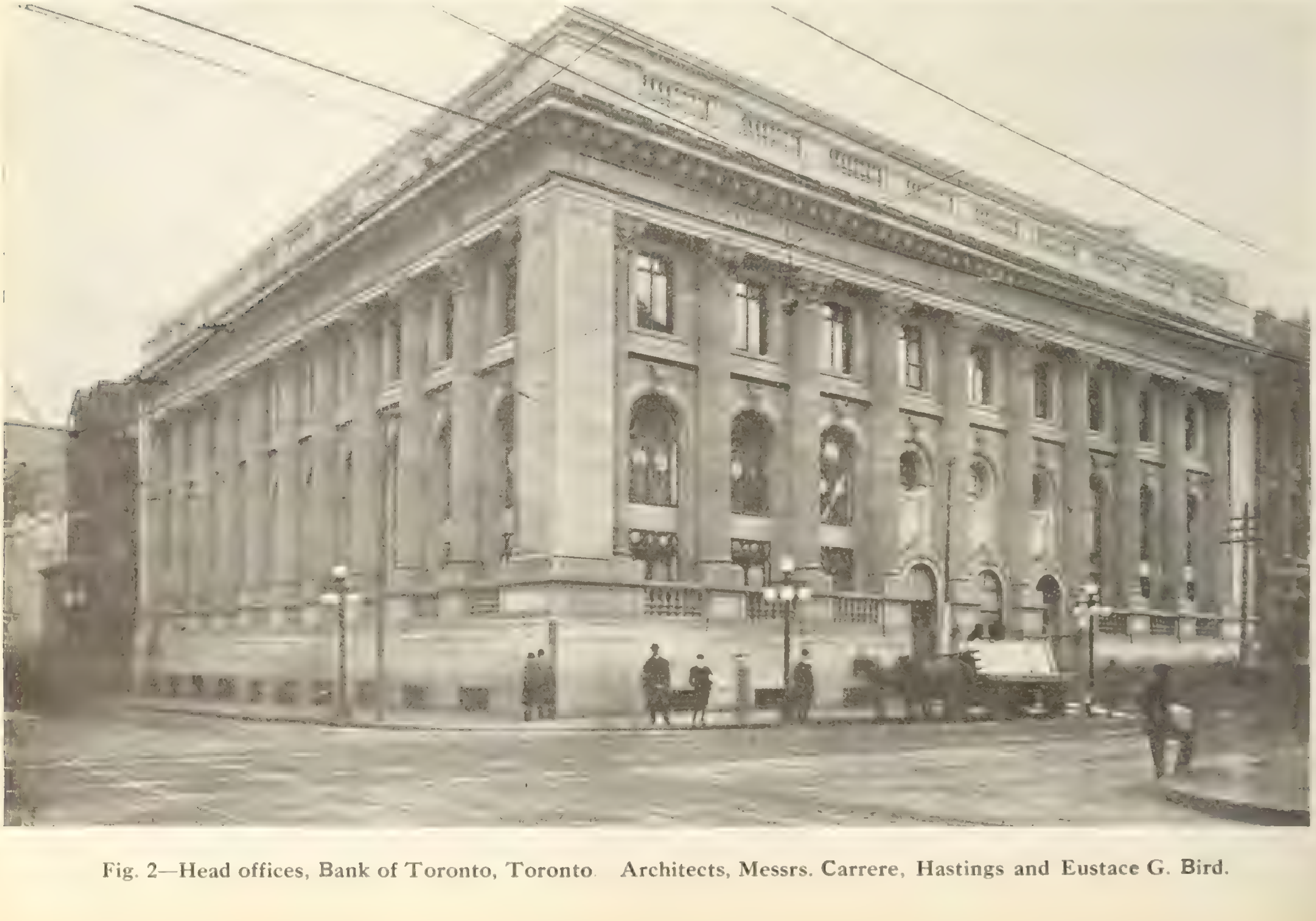


Fig. 2—Head offices, Bank of Toronto, Toronto. Architects, Messrs. Carrere, Hastings and Eustace G. Bird.

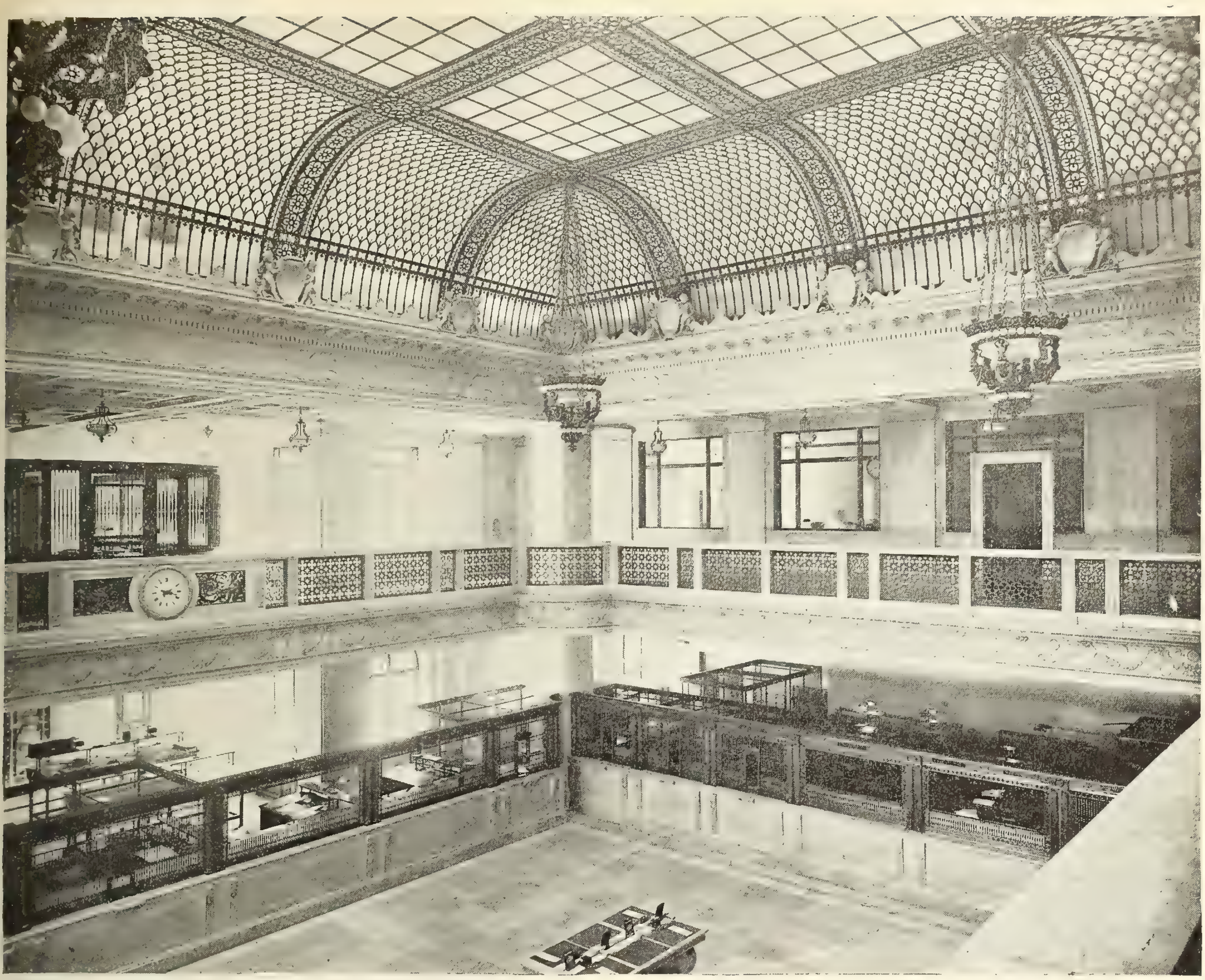


Fig. 3—Main banking room.

monumental vestibule finished entirely in Ceneri marble. The entrance from Bay street as well as the main entrance have vaulted ceilings of the same material. On either side of the vestibule is a beautiful six-light standard as shown in Fig. 1. The standards are made of bronze, the ornamentation on the stems being entirely hand-wrought.

Main Banking Hall

The rotunda, or public business hall of the bank, is the most striking feature of the interior. It is a spacious apartment with the counters arranged around three sides. There is not a column nor structure of any description to intercept the vision or give a sense of restriction; on the other hand, there is the feeling of surprise that such extent has been obtained. It rises to a height of three storeys and terminates in a magnificent dome of glass and cast bronze, unsurpassed for its beauty, probably, by any on the continent. The ornamental bronze of the dome, together with the ornamental iron and bronze of the gallery railing, elevator enclosures and stair rails, was manufactured by the Architectural Bronze & Iron Works, of the Canadian Allis-Chalmers, Limited, Toronto. The skill with which the work was executed and its erection effected, proved a source of great satisfaction to the architects in charge. The dome is glazed with muffled cathedral glass. The field is a pale amber cathedral, bent to meet the requirements. This material was especially made and imported for the color. The outline is a white plain cathedral glass and the effect of the whole is harmonizing and pleasing. The office doors are glazed with imperial plate prism glass, that is the pressed pattern glass on one side with a plate glass finish on the other, giving the doors a clean-cut appearance and almost jewel-like brilliancy. The ornamental glass for the doors and dome was supplied and installed by the Toronto Plate Glass Importing Company, Limited. A portion of this main banking hall and the bronze work of the dome are shown in Fig. 3. An abundance of softened light is admitted through the ample window spaces fronting on King and Bay streets and through the glass of the dome. The general work of the interior is finished in Botticino marble, a monotone of which one never tires and the appearance of which imparts an idea of strength and security. The counters are of Verdello marble with handsome bronze railings executed by the Gorham Company, New York.

The second storey surrounding the rotunda is a balcony or mezzanine floor. The monumental stairs leading to this are of Ceneri marble, with a cast bronze rail. The ceiling around the gallery is of Botticino marble.

The rotunda floor is of Hauteville marble with borders of several Italian colored marbles. All working spaces are provided with nonpareil cork tiling, furnished and installed by David E. Kennedy, Inc., of New York and Montreal. The cork tiling in addition to being sanitary and practically non-inflammable through being laid on a concrete bed, is noiseless and comfortable to stand or walk on. It is of natural wood color and quite agreeable to the eye.

A striking portion of the ornamentation of the rotunda is the four 60-light electroliers, probably the most beautiful ever installed in any public building in Canada. The lighting is semi-indirect. In these fixtures the centre bowl is of alabaster especially carved and imported from Italy for this work. The metal parts are of bronze, hand-chased and finished in gold. Some idea of their magnificence may be obtained from their dimensions. The alabaster bowl has a diameter of 3 ft. 6 in., the metal crown supporting the bowl is 5 ft. in diameter while the height from the bottom of the fixture to the crown is 15 ft. 6 in.

Mezzanine Floor

On the mezzanine floor are situated the cash and securities department, assembly and visitors' room, the bankers' library and correspondence department. What may be termed the third floor will be occupied by the president, general manager and inspectors. The board room and lunch room for the staff will also be found here. The fourth floor has been leased for office purposes. This floor rises on three sides above the exterior finish of the glass dome of the rotunda, serving to protect it and yet is not carried to such a height as to interfere in any way with the lighting. The interior of the various rooms above the ground floor is finished in Circassian walnut and panelled from floor to ceiling. The floor is of teak, a somewhat new feature in Canadian work. The mantles in these rooms are monumental in appearance and composed of various marbles handsomely sculptured.

The lighting fixtures of the mezzanine and the various officers' rooms are of an ornamental character and carefully designed by the architects to be in keeping with the general interior tone. The mezzanine is lighted by eighteen 6-light ceiling fixtures finished in gold. The bowl is of alabaster and was also especially imported. Fig. 5. In the rooms set apart for the officials of the bank, wood fixtures are used. These are hand carved and the finish is applied in gold leaf. The high lights are brought out by means of a polished finish with the receding details in a dull gold. By the combination of shades thus effected, the beauty of the fixture is greatly enhanced. Fig. 6. The lighting of the assembly room is accomplished by four 5-light bronze fixtures finished in Vernis gilt. Every part of these is cast and hand tooled. Fig. 7. The lighting fixtures were supplied and installed by the Murray-Kay Company, of Toronto.

The furniture of these rooms is among the finest if not the finest to be found in any public building in Canada. It is all of Renaissance style. The wood used is genuine French walnut, except in the president and general manager's waiting room, where the furniture is of quarter-cut Austrian oak. In the assembly room is a magnificent pedestal table fourteen feet long made of French walnut and richly carved by hand. There is also a smaller pedestal table and eighteen carved chairs upholstered and covered in pig skin leather. This upholstery is carried out in the visitors' room and board room. In the former the French walnut tables are provided with tops of Skyros marble. In the president and general manager's waiting rooms are comfortable arm-chairs with hand carved frames and a large carved settee, all made of Austrian oak. The furniture received the careful attention of the architects in order to maintain the unity of the interior appointments and was supplied by Murray-Kay Company, Limited.

Lighting

The question of securing proper lighting is always one of great importance and never more so than in an institution of this character. The windows for the King and Bay street elevations of the basement, ground, mezzanine and first floors and for the court windows opening into the banking rooms, were especially designed and made for this building by Messrs. Henry Hope & Sons, Birmingham, Eng., through their Canadian offices, Toronto. The large windows in the banking room are 6 ft. 9 in. wide and 21 ft. high and have a large ornamental cast bronze panel of design which is a work of art in itself. In order to obtain the required strength and at the same time provide the maximum amount of light, it was necessary to design especially heavy gun-metal sections, larger and heavier than has been used, it is said, in any part of the world, the metal being made according to the same specifications as those adopted by the British Admiralty. The casements are fitted with the highest quality of ornamental bronze hardware, the whole being finished in

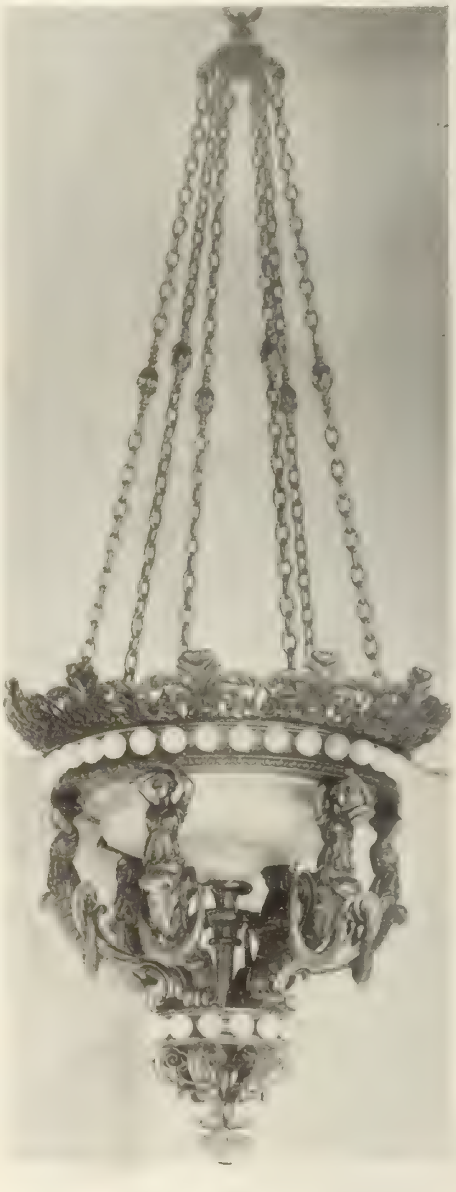


Fig. 4—Main banking room fixture.

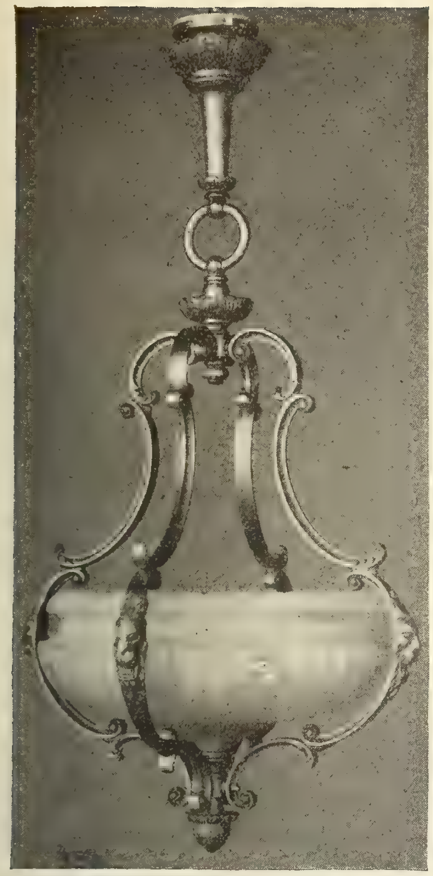


Fig. 5—Balcony.

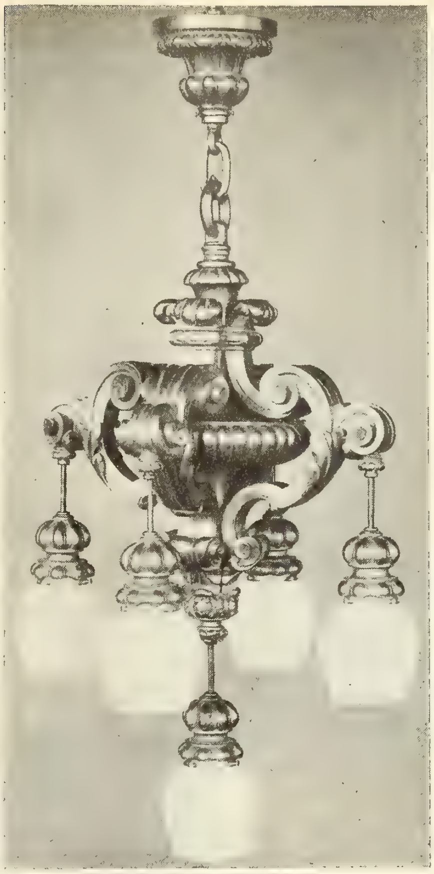


Fig. 6—Private offices.

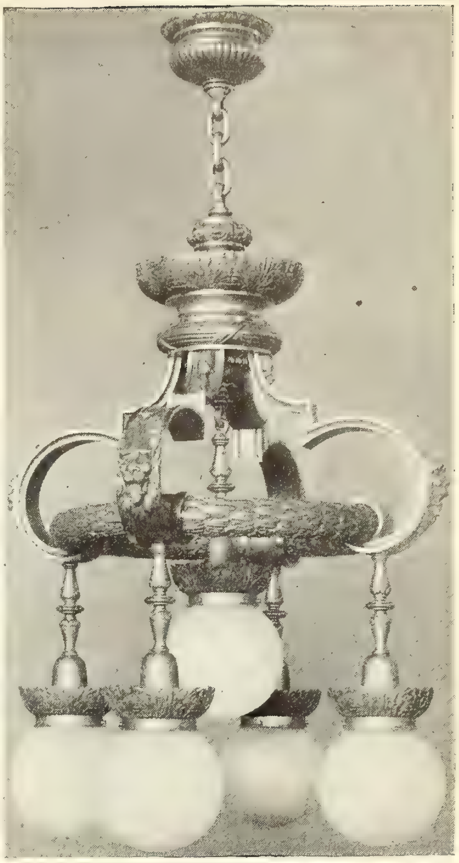


Fig. 7—Assembly room.

beautiful chocolate bronze color and they are recognized as among the finest windows of their kind ever produced.

The frames for the windows of the office suites were manufactured and installed by the A. B. Ormsby Company, Limited, Toronto. The frames here are of the double hung type with metal drawn on wood under heavy pressure and conforming to a most exacting standard of good workmanship. The various skylights in connection with the building were manufactured and installed by the same company and are what is known as the Ormsby Underwriters skylight. The glazing bars are constructed with a heavy core, giving a maximum of strength. We may add that the same company also provided the copper clad doors for the rear entrance and roof houses and also the roofing work.

Master Key System

The finishing hardware of the interior comprises a number of rather attractive features. This was especially designed by P. &. F. Corbin, New Brittain, Conn., and supplied through Freek, Clark & Company, Toronto. The master key system has been very carefully worked out and the locks are master keyed and grandmaster keyed to meet the special conditions of a banking institution. The coupon booth doors are so arranged as to guarantee a customer absolute privacy while checking monetary transactions. The lock on the outside of the door indicates when the booth is occupied and can be unlocked only by a person in authority who has a key which passes these locks. The occupant however can open the door at all times from the inside without necessitating the use of a key.

EQUIPMENT

The power house with its switchboard and auxiliary equipment, boiler room, engines, air cooling and purifying apparatus, is found in the sub-basement. This little plant, Fig. 8, because of its compactness, convenience of arrangement and success in operation, is an excellent example of what skill and foresight can accomplish. The walls and floor of the power house are of white enamelled brick, and the floor space covers an area of 1,800 square feet. To guard against any possible contingency arising from the failure of a power supply on the part of the local distributing company, a steam driven direct current generator plant has been installed with a capacity of 200 kw. There are four generators in the equipment made up of two 75 units and two 25 units, each connected with its own engine. The generators were supplied by the Canadian General Electric Company, and the engines are Robb manufacture.

Boilers and Engines

The boilers in connection with the plant were constructed and installed by the McKenzie Furnace Company, New York. Each is provided with a Dutch oven, in which the coal is coked before being admitted to the firebox. By this process all danger of the smoke nuisance is eliminated. In order to keep the coal from burning during the process of coking a continuous flow of water is maintained around the ovens. All gases produced during the process are forced over the firebox and aid in the work of combustion.

The engine equipment consists of two 9 in. by 10 in. horizontal slide valve engines direct connected to the 25 kw. generators at 310 r.p.m.; also two 13 in. by 14 in. horizontal slide valve engines direct connected to two 75 kw. generators at 275 r.p.m.

The steam valves of these engines are the straight line type scraped through and balanced against steam pressure by a heavy plate held away from the valve-seats by distance strips 2/1,000 in. thicker than the valve, thereby allowing it to move more freely. Double port openings in the valve allow the steam to enter the cylinder and exhaust quickly.

The pistons are made as light as possible to prevent wear to the cylinder, and so that the piston may break before the cylinder or head in case of confined water.

The engines are equipped with the Robb-Armstrong Sweet governor, giving a throttling effect on light load and reducing range of temperature in the cylinder; also as the load becomes greater the initial pressure approaches full pressure in steam pipe, giving a steam distribution well adapted to economy in variable loads. The shaft bearings consist of interchangeable removable shells which may be adjusted while the engine is running.

The oiling system consists of positively driven pump attached to the crank pin which draws oil from the base and distributes it through the pipes to the bearings. The regulation of these engines is 1 per cent. from light to full load.

Additional Electrical Equipment

The switchboard, which was supplied by the Northern Electric & Manufacturing Company, is completely equipped. To the left are two Weston volt meters. On the main part of the board are eight ammeters, also of Weston type. At each end to the right and left of the ammeters is a Duncan recording watt meter. At the centre of the board an Esterline recording volt meter has been installed. The circuit breakers are I. T. E. type. A small motor generator set is also to be found in the generator room, 50 amperes 20 volts, used chiefly for storage battery work. This is controlled by a battery board which works in conjunction with the motor generator and batteries through eight branch switches, one motor switch, one generator switch and two charge and discharge switches. This board carries three ammeters, one volt meter, pilot lights, etc.

The battery consists of sixteen 20 ampere hour cells. These are used chiefly for telephones, call bells and annunciators. The building contains 52 telephones, which will be under the control of the bank's own switchboard in a specially planned telephone switchboard room. This central room will also be used as a centre for the automatic air pressure messenger system which has been installed throughout the building. The electrical equipment also includes a system of electric clocks, which will be under the control of one master clock. This means that if the master clock is correct so are all the others in the building. There will be seventeen in all, including the master clock, which is located in the clerks' lunch room on the second floor. Two of these clocks present a particularly fine appearance and stand in the balcony of the main public banking room. They have 16 in. marble dials.

Elevators

The elevator equipment consists of three passenger elevators, one freight elevator, two dumb waiters and the necessary pumping plant. Near the King street entrance is situated an hydraulic plunger elevator which plies between the ground floor and the second floor. It has a capacity of 2,000 lbs. and a speed of 250 feet per minute with a load of 1,200 lbs. A second hydraulic plunger passenger elevator is situated near the Bay street entrance and runs from the basement to the top floor. This elevator has the somewhat greater capacity of 2,200 lbs. with a speed of 300 feet per minute for a load of 1,200 lbs. This latter elevator runs from the basement to the top floor. An automatic push button elevator maintains communication between the main and first floors near the vault. It has a capacity of 1,500 lbs. with a speed of 150 feet per minute for a load of 1,500 lbs. The hydraulic freight elevator travels from the street level to the sub-basement. One of the dumb waiters is used for service work and the other serves as a booklift. Both are of the automatic type and can be used at any floor. They are actuated by 7½ h.p. electric motor. The hydraulic elevator pumping plant consists of two Worthington duplex tandem steam pumps 12 in. by 10½ by 10 in. situated in the sub-basement. Water is pumped into a pressure tank at 150 lbs., from which the elevators are operated. In the sub-basement is also placed the discharge tank. The elevator equipment was installed by the Otis Fensom Elevator Company.

Heating and Ventilation

The heating system is a combination of hot air and steam heat, the latter being employed in the top floor. In connection with the Webster system of circulation which has been installed there are two vacuum pumps, one driven by a Bruce Peebles' motor and one steam driven. By these the condensations from the radiators and "Vent" heaters are drawn away and delivered into an air separating tank. From this the water drains into the feed water heater. The radiators are heated by exhaust steam.

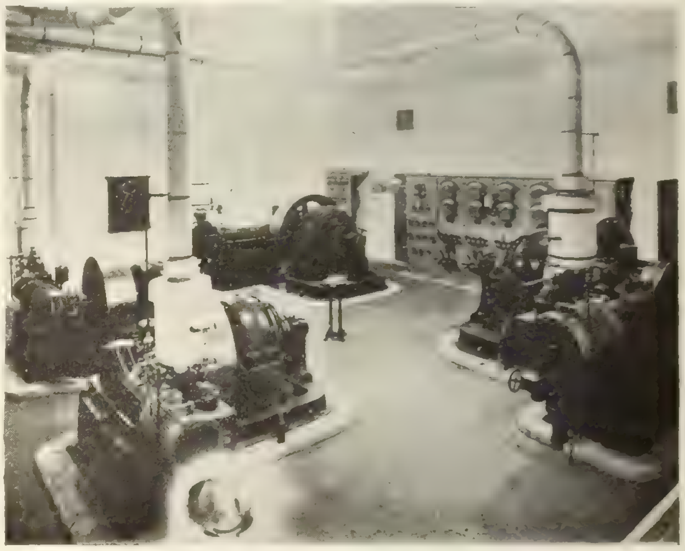


Fig. 8—Steam electric plant.

The hot air system of heating and ventilation is a most interesting feature in connection with the equipment. It consists of supply and exhaust fans and ducts with heating and washing apparatus. The fans are motor driven. The lavatories have a separate system of ventilation. Each room is provided with a thermostat by which it is possible to regulate the temperature to any desired degree.

Water Filtration

In order to provide pure water for the institution a filtration plant has been installed. The water upon entering the building passes through a filter which is so arranged that it may be readily cleansed. From here the water passes into a sterilizer where the water is heated and sterilized. It is then cooled and by means of a pump, circulation is kept up throughout the building.

Pneumatic Tubes

The pneumatic tube system very materially facilitates business. There are 23 stations situated throughout the building. The compressed air for this service is provided by a Connersville horizontal rotary blower, which has a capacity of 13 cubic feet of air per revolution and is driven by a 10 h.p. 400 r.p.m. motor. A vacuum cleaner system is connected with every room in the building. A 7½ h.p. motor provides the energy and it is so arranged that the motor can be started or can be stopped by switches situated at various points throughout the building.

The galvanized duct work for ventilation and heating and for the installations requiring duct work was erected by A. Matthews, Limited, Toronto.

Incinerator

A rather unique feature in connection with the equipment is the incinerator for the periodical destruction of retired currency. This work must be done with the absolute assurance that none of the old bills can escape and that the process of reduction will be complete. The incinerator plant is situated in the incinerator room in the basement. In appearance it resembles a steel clad vault or safe, with massive safe doors and smoke pipe from the top. When the outside steel door is opened a second cast iron heavily baffled door is encountered, which, on being opened, discloses the retort or reduction chamber. This chamber is 2½ ft. square by 2½ ft. high and is completely lined with highly refractory fire clay blocks and terminates in a perforated arch through which small openings allow the products of combustion to pass into a second baffled chamber, and finally to a third chamber before escaping. The burner is designed to produce and retain 2,800 deg. of heat which is sufficient to melt iron. The fuel and heat producing medium is gas with a large proportion of air supplied by an electric motor and blower apparatus. These are regulated by a series of adjustable valves admitting the amount of gas and air necessary for the operation. On a test the incinerator reduced $500,000 of old notes at one burning in fifty minutes. The quantity of bills thus represented completely filled the retort and gave approximately 9½ cubic feet of paper in solid. This incinerator was installed by the Toronto Furnace & Crematory Company.

No bank equipment would be complete without a system of vaults. In the basement are to be found a series of safety silver deposit vaults. The vaults for the banking purposes are found on the first and second and third floors, two vaults on each floor. These have probably the heaviest tonnage of any on the continent, having an aggregate weight of approximately 400 tons. They are of brick construction lined with 3 in. steel and provided with doors having a thickness of 2 ft. and furnished with double time locks. Further protection is given by the installation of a watchman's detective service and fire equipment.

All doorways in the basement and sub-basement are protected by kalemeined copper doors. They are said to be of the highest class kalemeined work manufactured in Canada. The outstanding feature is that they are not marred by exposed nails as is the case in many ordinary kalemeined doors. These were furnished by Messrs. McFarlane, Douglas & Company, of Ottawa, through Messrs. Douglas Milligan, Limited, Montreal and Toronto.

The general contractors for the work of construction were Messrs. Norcross Bros.

Reinforced Concrete Arches

By V. J. Elmont, A.M. Can. Soc. C.E.

As an example of the extent to which reinforced concrete may be used in farm buildings is given below a description of a stable building made almost entirely of that material. The building is 73 ft. 8 in. by 47 ft. 6 in. As no columns were allowed on the interior of the building and as it was an absolute necessity that the floor should be able to carry a live load of 70 lbs. per square foot, the usual method of construction was not available. The beam and slab structure used generally under these circumtsances would have been too expensive and the outside walls would have to be carried to a great height in order to obtain sufficient clearance for the beams.

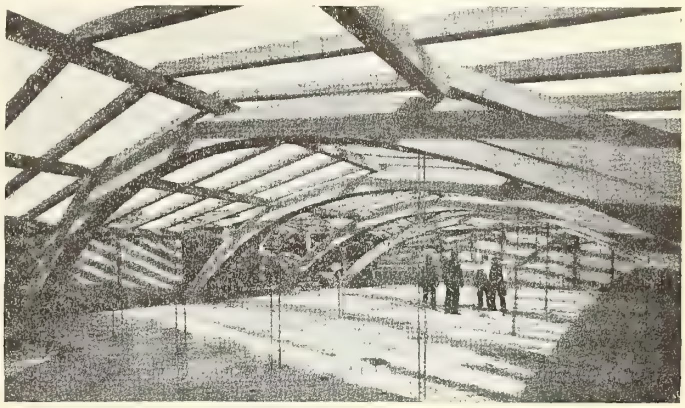


Fig. 1—Arches in position.

The structure actually built was much more economical. Over the building was arranged 4 arch girders (Figs. 1 and 2) resting on reinforced concrete columns in the outside wall. The arch girders at the crown have a depth of 16 in. and 20 in. at the springing line.

The ceiling is suspended to the arches by means of plain round bars having a diameter of 14 mm.; there are 12 bars over each arch.

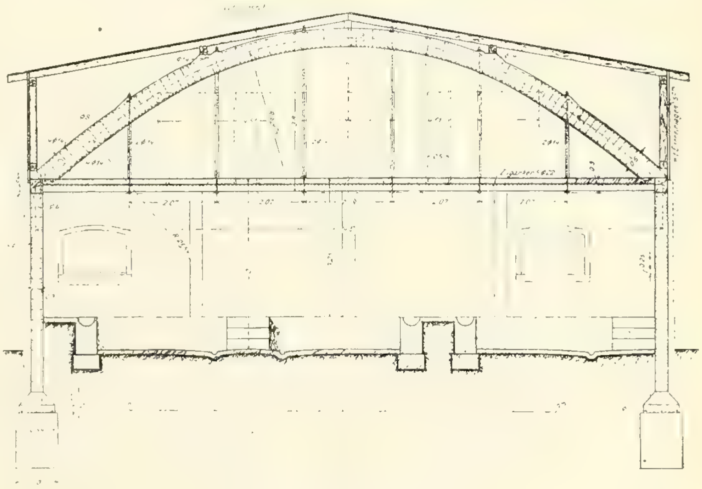


Fig. 2—Cross section.

The statical computation for the arch girders was made as for arches with two hinges, as the arches are simply supported on the columns and only connected with the ceiling through the tie rods embedded in it.

The maximum compression stress in the concrete is 550 lbs. per square foot and the tensile strength of the steel 14,300 lbs. per square foot.

Animal Growths in Water Pipes

Prevalent in Unfiltered Water — Influence of Temperature — Effects Upon Water—Rapidity of Growth—Methods of Removal

The retardation of the flow through water mains arising from incrustations of bacteria has frequently been discussed. Animal growths which sometimes appear in mains where unfiltered surface water is being carried have not been so fully treated. These animal growths not only cause trouble through retarding the flow but frequently give rise to unpleasant taste and odor. Mr. Samuel C. Chapman, water engineer of Torquay, Eng., recently discussed these formations before the Institution of Water Engineers at Wakefield. We publish this interesting article as it is reported in The Surveyor.

Much has been written in recent years concerning the incrustation of water pipes, and the retardation of flow due to the action of Cladothrix and kindred organisms, but comparatively little has been said, in English circles at least, of those animal growths which sometimes appear, and whose presence has been the source of considerable anxiety to those responsible for the administration of the undertaking in whose mains the creatures have ensconced themselves. That so little has been written on the subject is probably due to the fact that in the majority of works the whole of the water sent to the consumer is filtered, and the state of the pipes conveying water to the filters is not a matter of great concern, provided their efficiency remains unimpaired. Further, the difficulty rarely, if ever, arises in connection with supplies drawn from underground sources, so that the question of animal growths is limited practically to those undertakings whose supplies are drawn from rivers or from upland surface sources.

In the early days, before filtration was so universal or had reached its present state of efficiency, it was not an uncommon thing to hear of almost every description of fauna inhabiting the distributing mains, especially in cases where the supply was drawn direct from rivers and streams. Among the older records mention is often made of eels or other kinds of fish, and mussels, to say nothing of sponges and pipe moss, or Polyzoa.

Prevalence in Unfiltered Water

The history of the cholera outbreak at Hamburg is so well known that more than a passing reference thereto is unnecessary. The close and exhaustive investigations which followed that terrible visitation revealed the fact that the Elbe water, which was unfiltered, carried with it into the city's distributing mains sufficient nourishment to sustain the most prolific species of animal life. Besides sponges and Polyzoa, which furred up the pipes to a considerable extent, there were found snails and water-lice in hundreds at every examination, while mussels, eels, sticklebacks, and even flounders made their homes in the water mains. Dr. Kraepelin tells us that he found over fifty genera of animals in the pipes. Since the introduction of filters, however, the numerous inhabitants of the pipes have died off, and at the present time there are no animal growths of any description in the Hamburg distributing mains.

It is hardly necessary to remark that no one at the present time ever expects to hear of such highly developed animals as fish or eels in a town's distributing mains, yet in many works where filtration has not been adopted the lower growths are to be found in the pipes, and in some instances to such an extent as to cause much trouble and anxiety to those responsible for the administration of the supply. In the United States especially has this been the case, and Whipple has stated in reference to such growths as sponge and Polyzoa: "They are found in the pipes of New York City, Brooklyn, Boston, in many small places in New England, and in fact in most of the cities of New England where surface waters are used without filtration." There are, no doubt, many instances in this country where animal growths exist in pipes and conduits, which, by reason of their moss-like formation, have been wrongly ascribed to the vegetable kingdom.

Where water is drawn from rivers or impounding reservoirs without filtration, small free-swimming creatures are often drawn into the pipes, and so find their way into service reservoirs, and thence into the distributing mains. At certain seasons of the year their numbers may be very considerable, and the changes of temperature in the water in impounding reservoirs causes them to transfer their feeding grounds to such levels as may be within the area of influence of the draw-off pipes, and vast numbers may be carried into the mains thereby. The quantity of such life in a reservoir depends largely, or it may be said entirely, upon the available food supply therein, and in the new works, where food is more abundant, the number of these animals would be proportionately large.

A Remarkable Instance

The author had under his observation a short time ago a remarkable instance of the presence of these organisms in their myriads. The supply was drawn from a storage reservoir which had been in use for about five years, and before entering the trunk mains the water was passed through a battery of mechanical filters. These, under ordinary conditions, required cleansing every seven days. It was found necessary to wash them out more and more frequently, and at last the interval between successive washings was reduced to four days.

The manhole of one of the filters having been removed, it was found that the rapid clogging up was due to the presence of Daphnia, which covered the surface of the filter to a depth of ½ in. or more. To ascertain whether the whole reservoir was alive with these creatures, samples of water were taken at various depths (the reservoir was 50 ft. deep), and it was found that they were assembled in the greatest numbers at a depth between 15 ft. and 20 ft. from the surface. The water being then drawn off at another level, the filters were at once relieved of the extra work they had been called upon to bear.

The open surfaces of water, whether in service reservoirs, clear-water tanks, or in channels, lend themselves to the introduction of free-swimming animals into water mains. As is well known, many winged insects lay their eggs at the margins of open-water surfaces, and when these hatch out the larvae spend one part of their existence as free-swimming animals before reaching a further stage in their development. The larvae sometimes find their way into the pipes, and some may even reach the consumers, and although their presence may be easily accounted for, and it may be proved conclusively that the water has been properly filtered, the man in the street will still be of the the opinion that there is something amiss with the supply.

Insect Larvae

The larvae of the Dipterous insect are frequently found in mains carrying water from surface sources, and the author has observed them frequently among specimens of sponges and Polyzoa taken from mains and aqueducts in various parts of the country. Water-snails and water-lice, too, are to be found associated in the same manner with Polyzoa in various forms become lodged in pipes they at once attract large numbers of creatures which either prey upon them or shelter among their tangled masses.

Some years ago the author witnessed a rise of flies from the surface of a reservoir at Plymouth (the water was unfiltered). The caretaker reported that the screens at the outlet, which had an area of about 150 sq. ft., were blocked, and the reservoir was overflowing, a most unusual circumstance. A close examination revealed the fact that winged insects were rising in myriads to the surface, and while so doing many were drawn against the screens and killed. The dead bodies of these flies were jammed into a solid mass of considerable thickness against the surface of the screens. Above the structure of the reservoir were swallows innumerable, which found an easy living on this occasion at least. Without these screens considerable annoyance would have been occasioned to many consumers by the influx of these insects into the town's water supply.

Fortunately, many of these free-swimming organisms do not, as a rule, make the pipes their permanent abode, and they may be regarded simply as occasional and unwilling passengers on their journey to ends unknown, and, furthermore, they often become broken up to such an extent that little remains which can de detected without the aid of the microscope. There are, however, organisms which find the inside of pipes a most congenial place in which to take up their residence, and among these pipe-moss or Polyzoa and sponges are worthy of special notice. The first of these has been found in a variety of forms in many water undertakings in this country and on the Continent, while, as previously stated, they are found in nearly every unfiltered surface supply in the New England States of America. Sponges are also common in surface waters, and are found under almost the same conditions as the Polyzoa.

The question naturally arises as to whether and in what respect these growths are injurious to a water supply, and it may be said at once that they are not pathogenic. Dr. Kraepelin has informed the author with regard to Polyzoa, etc., that: "These organisms in pipes are not at all injurious, but, on the contrary, they consume the debris, and thus make the water purer."

Whipple is guarded in his remarks upon this question. In "The Microscopy of Drinking Water" (p. 168) he says: "In a certain sense they tend to improve the quality of the water by reducing the number of floating microscopic organisms; but they themselves must in time decay, and anyone whose nose has ever had an experience with decomposing sponge will appreciate the fact that better places for these organisms may be found than the distribution system of our water supplies. It should be stated, however, that in all probability very large quantities would be required to produce tastes or odours that would be noticed in the water."

Difficulties Caused

One of the chief objections to these growths lies in the fact that they produce mechanical difficulties which are exceedingly detrimental to any water undertaking: thus at Hamburg, sponges, Polyzoa, and other organisms were found covering the interior of the pipes to a considerable thickness, and to such an extent that the capacity of the pipes was seriously interfered with. At Antwerp, Dr. Kemna some years ago discovered a growth of Polyzoa in a 24-in. main conveying unfiltered water, which reduced the clear diameter of the pipes to 16 in.

Whipple, writing to the author in regard to the growths of Polyzoa in water mains, says: "In regard to the sizes of pipes that have been choked with pipe-moss, I do not know that I have ever seen a pipe actually clogged that was larger than 2 in., but I have seen 4-in. pipes that were nearly full, and it is not at all uncommon to find growths from 1 in. to 2 in. thick in 8-in., 12-in., and 24-in. pipes."

In many cases the surface of the growths resembles thick rough matting, while in others they are surrounded by a collection of mud and slime. Sponges are most irregular in their growth, sometimes forming a thick, smooth surface, while other forms may protrude long finger-like projections into the water.

The author examined a 12-in. pipe some time ago which was coated with sponge to a thickness of nearly ½ in. This was found to have a very rough surface. The growth had covered up the rust nodules that were on the surface, and had used these irregularities evidently to their own advantage by sending therefrom projections into the water area for the better acquirement of food. The result was a surface of the worst possible type for obtaining an efficient flow of water. There is little doubt that these growths not only reduce the sectional area of a pipe to a considerable extent, but the rough surface which they form adds another factor which again materially reduces the flow. It is held by some that these organisms (Polyzoa especially) tend towards the production of rust nodules, that they become firmly attached to the pipe coating, and when they die down or become torn away from their positions the coating is damaged, and in some places entirely detached from the metal, leaving the surface exposed.

However, although the effects of these organisms so far mentioned have been chiefly prejudicial to the water authority, the consumer has just as much cause to resent their presence. The natural death of the Polyzoa, as well as those conditions which sometimes bring about their wholesale destruction, liberate into the mains large masses of tangled, moss-like growths, which become broken up and carried into every part of the system, following generally the direction of greatest demand. It thus follows that the most important supplies are those which first feel the inconvenience of their presence. The house services are first blocked at the ball valves, and metered supplies follow. Unfortunately the trouble is not of a single day, but may continue for a long period.

In Torquay, among many instances, the following may be quoted: On one occasion eleven houses in one row were without water from this cause on the same day; in another case an important metered supply was blocked upon four successive days; while on another occasion an electric lighting station within the area of supply was nearly forced to close down at the time of maximum load because the meter was blocked.

Last year, at New Canaan, Conn., U.S.A., a growth of Polyzoa which had become established in the pipes died off, and while in some instances the heating apparatus in houses became blocked and burst, the choking of the house services was almost general. The author has also heard of a case where a water famine was caused entirely by Polyzoa (Paludicella) blocking up the house services. This happened in our own country a few years ago.

Rapid Growth

Some idea of the rapidity with which these growths can spread may be obtained from the study of their production. The author has had experience with the Polyzoon, the Plumatella, Emarginata, Muscosa, which was found in the Torquay mains before the introduction of filtration. In September, 1910, it was discovered for the first time at Newton Abbot; within a year it was found in every part of the district of supply, and only those who have had experience of such a visitation can realize what that means. This particular growth has two means of reproduction—first, by the production of free-swimming larvae; and, secondly, by statoblasts, or winter eggs. A single egg develops inside one of the parent tubes, and in due time produces a free-swimming larva. After the production of larvae the parent organisms then produce the statoblasts. These are in two forms, the sessile and the floating statoblasts. The first germinates at the foot of the parent tube, so that when the latter dies down there is a new Polyzoon ready to perpetuate the growth upon the old position. The floating statoblasts are developed in great numbers in the upper portion of the tubes. These statoblasts are oval in form, and are surrounded by an equatorial band, and between this band and the statoblast body there are developed small air cells. When the parent dies down these float away, and are carried wherever the water travels, thus spreading their kind over very considerable areas. It will be at once seen how these can be scattered over a waterworks system at a very rapid rate.

The Important Question

The main question for water engineers is: What means can be adopted to remove these creatures from the pipes?

Many attempts have been made, and with partial success. The only safe and satisfactory method is starvation—that is to say, to filter out the Plankton which forms their food—and they must then die off, and the trouble be ended once and for all.

It may be asked whether it is possible adequately to treat water in bulk in storage reservoirs so that these growths may be eradicated at the sources of supply, and the author therefore quotes the following from a communication he received from Dr. Krapelin in reference to the Hamburg mains: "No means of prevention has been tried at Hamburg; it would, indeed, have been quite impossible without poisoning the inhabitants of Hamburg at the same time. . . . The destruction of this growth can only be brought about by the withdrawal of nourishment—that is, by careful filtration of the water."

Dr. Kemna, at Antwerp, had only a short length of main to deal with, and it was possible to isolate this and to turn live steam into it, with the result that the creatures were cooked. Water was afterwards turned in and the dead growth flushed out.

In the case which occurred at New Canaan, Conn., U. S. A., referred to earlier in the paper, the death of the organisms was brought about by chance, and in an interesting manner. By some accident the bottom valve from the storage reservoir was opened, and the water therefrom was used for a week or two. This water, being devoid of oxygen, caused the death of the organisms in the pipes, which afterwards gradually came away from the mains.

In several instances flushing under heavy pressure has been resorted to, with only partial success, owing to the fact that if a solitary statoblast or a sponge larva remains the whole trouble may recur.

The available evidence all tends to show that filtration is the only complete remedy for the trouble caused by these growths, and, referring to the Polyzoa, etc., in New England waterworks, Whipple states definitely that "Where water is filtered, or where ground waters are used, they do not occur." Unfortunately, however, surface water supplies are at any time liable to a sudden development of these animal growths, as is shown by the following facts: In Torquay the supply has been drawn from the same sources since 1859, and up till September, 1910, no single trace of Polyzoa had ever been seen. Suddenly, within a period of twelve months, the growth spread to every part of the area of supply. There are three storage reservoirs from which the supply is drawn. The highest has an elevation of 820 ft. above ordnance datum, and holds 194,000,000 gallons, the second holds 103,000,000 gallons, and has a top-water level of 783.6 above ordnance datum, the third reservoir holds 171,000,000 gallons, with the overflow at 769 above ordnance datum. This last has only been in use five years, while the others have been in operation for a long time. Curiously enough, the growth was greatest in the area supplied from the highest reservoir, and never before the date given was any trace of it seen. That the growth is fairly well established in the reservoirs is determined by the presence of numerous statoblasts on the surface of the filters. The only suggestion which can be made as to their introduction is that they were carried either by wild fowl or with fish obtained for stocking the reservoirs.

Construction of Factory Buildings

THE following brief summary of an article on Factory Construction, by Mr. J. Herbert Pearson, M.S.A., of London, Eng., should prove interesting to architects and builders.

The writer holds the view that a building used for factory purposes should be looked upon as a labour-saving appliance, and in planning, the building should be so arranged that all the different processes of manufacture can be carried out in sequence, in order to effect economy in labour and to reduce the cost of administration.

The present requirements, and those of the immediate future, will determine the size of the factory, but the possibility of extension should also be considered and provisions made which will allow of this being done later with utmost economy and minimum inconvenience.

Site and Design

Some of the chief considerations are: (1) Suitable area and shape capable of efficient development for present and future requirements; (2) A position ensuring a plentiful supply of labour ; (3) Adequate transport facilities; (4) Ample water supply; (5) Efficient drainage; (6) Cheap distribution of gas or electricity for power or lighting purposes; (7) Reasonable local rates; (8) Sufficiency of housing accommodation for work people.

The design will depend on the class of building, the materials used in construction and the requirements of the local authorities, but the elevation, as far as possible, should define the purpose for which the building is used. A very ornate elevation, in most instances, is unsuitable, but effect can be obtained by good proportion and careful selection of materials. A well designed building is always an advertisement for a manufacturer.

There are many matters of detail which require the collaboration of architect and engineer, but the former should have experience in factory design and be familiar with engineering practice. Without this knowledge he cannot so well interpret the views of the engineer, and difficulties and misunderstandings may arise.

Comfort and Convenience of Employees.

After considering trade requirements and accommodation for machinery and plant, attention must be given to matters arising out of the Factory Act respecting the comfort and convenience of employees. Where both men and women are employed, separate closet and lavatory accommodation is required, and for certain trades an ample hot water supply for the lavatories is necessary in addition to cold supply. Cloak rooms and, in some cases, mess rooms must be provided and also offices for the staff. The factory must be well lighted, ventilated, and warmed, and the area of cubical contents conform with the requirements of the Public Health Act, which stipulates 250 cubic feet of air for each person employed during the day and 400 cubic feet during overtime hours.

Building Laws

The numerous requirements of the local authorities must receive special attention, as they materially affect factory design. In London, these matters are mostly under the control of the London County Council, but the building laws in other districts are on similar lines.

The use of thinner walls gives increased floor space and effects some saving in cost, but makes it imperative to construct a steel skeleton, or frame, designed to sustain safely and independently the whole dead load, and the superimposed load, bearing upon such framework.

The London County Council also have power to make regulations, subject to the sanction of the Local Government Board, for building in reinforced concrete. Its use for floors is advantageous, but for walls, which for economy must be thin, it is somewhat difficult to keep out dampness and there may be trouble with condensation. The merit of ferro-concrete consists in its economy of construction, monolithic character and fire-resisting qualities.

Means of Escape in Case of Fire

Factories must be provided with adequate means of escape in case of fire, and the decision, in London, rests with the London County Council. Internal staircases providing means of escape must be of stone or hardwood, and have fire-resisting enclosures with exit doors made to open outwards and to clear the landings. External escape staircases are usually of steel.

Now that petrol is so much in use, the local authority, which in London is the Public Control Department of the County Council, requires an application for a license to store petrol, and impose certain restrictions. In garages and other places where there may be petrol leakage, specially built brick separating chambers must be included in the drainage system to prevent any petrol discharging into the sewer. The Council have recently obtained powers for controlling the construction of Petroleum Oil Depots, which include premises where large quantities of petroleum are stored.

Fire Risk

By the judicious use of fire-resisting materials the danger from fire may be minimized and, further, if the architect in his design follows the requirements of the fire offices with respect to the construction of party wall doors, skylights, and other matters in which they are interested from a fire protection point of view, a substantial reduction in premium may be secured.

Apart from the construction of the building, it is desirable to provide some means of fire protection by fitting fire hydrants with hoses in convenient positions, providing chemical fire extinguishers; and, in some cases, by installing automatic fire sprinklers.

Heating and Ventilation

In cold weather, it may be necessary to warm the factory by artificial means to maintain a temperature of about 55 degrees Fahrenheit. Exhaust steam, when available, may be used efficiently for this purpose, but in most cases an installation of circulating pipes and radiators heated by hot water from a central boiler is suitable. Owing to recent improvements in hot water apparatus, it is not essential to have the boiler in the lowest relative position, as is the case with the ordinary low pressure gravity system. For occasional use, gas-heated radiators are more suited.

Natural means of ventilation by open windows and extract ventilators are not always sufficient, and it may be necessary to provide fans for bringing in the fresh air, or for extracting the foul air.

Acquisition of Existing Buildings

When acquiring business premises, by purchase or by taking a lease at rack (or inclusive) rent, the manufacturer is apt to be unduly influenced by a low quotation and convenience of plan, which are so essential both in obtaining business and in reducing the working costs.

The many considerations in selecting a property make it necessary for the prospective tenant, in the first instance, to instruct an architect to make a survey of any likely premises and to report upon their stability, their structural condition and cost of conversion to suit the particular trade. If, the property is worth favourable consideration, then the architect should express an opinion as to its value and give an approximate estimate of the sum required to repair the buildings and to make the necessary alterations. Where the freehold of the property cannot be obtained, the lease should be for a sufficient term of years to justify the cost of the alterations and repairs. In either case the price to be paid for a property must be considered in conjunction with the subsequent cost of alterations, repairs, and upkeep of the premises.

Important Drydock Construction*

General Description—Method of Building Walls—Emptying and Filling the Lock — The Gates — Power House

Vertically operated floating gates are employed at Keokuk, Ia., on the new lock and drydock which the Mississippi River Power Company is building for the U. S. Government to replace the three locks and 9 miles of canal submerged by the construction of the dam and power plant. On May 8 water was turned through the fifteen 10,000 h.p. wheels, and since July 1 electrical energy has been transmitted regularly to St. Louis. The lock is complete and the first boat passed through it on June 12. The drydock site is being filled and will probably be complete by September 1.

The lock, drydock and lock grounds are located on the Iowa side of the river. As the existing dock occupied space under the new drydock, it was possible to maintain traffic during the construction of the new lock. Features included in the works, which will be turned over to the U. S. Government, are a lock, 110 ft. wide by 400 ft. long, with a lift of 40 ft.; a drydock 150 x 463 ft. in plan, a power plant of 400 h.p. capacity for operating the gates located in the wall connecting the lower end of the main power house and the upper end of the lock, an intake and discharge system controlled at inlet and outlet by four air-operated cylindrical gates, swinging steel miter gates at the lower end of the lock, interchangeable floating gates of a novel design for the upper lock gate, the guard gate and the drydock and an elaborate central system of control of the compressed air by which all of the machinery is driven. Below the mitering gate is a needle dam by which the tail-water may be excluded to permit laying dry the floor of the lock and the culvert system.

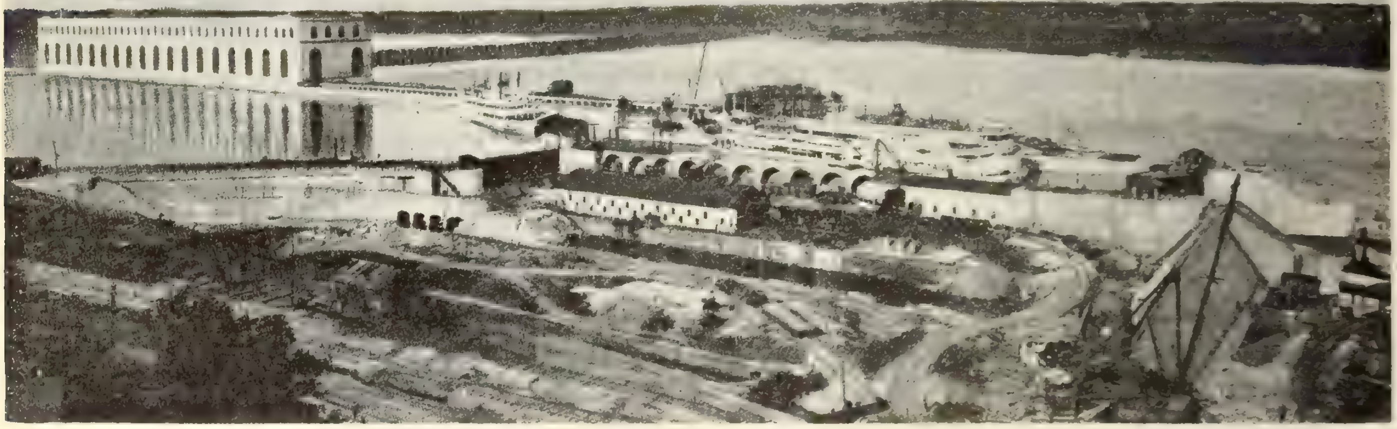
Foundations for the various structures were excavated from the limestone ledge, which is so nearly level at El. 480 that little or no trimming was necessary. The lock floor is not covered with concrete except to fill in around the culvert pipes.

The original cofferdam inclosed practically all of this work with the exception of a portion around the lower end of the old lock, through which traffic was not interrupted until the new lock was ready to operate.

Lock Walls

Walls of the gravity type, built of 1:3:5 concrete, form the sides of the lock. They are 33 ft. wide at the bottom and 8 ft. wide at the top below the 20-ft. esplanade, supported on inset arches, which also give stiffness to the walls. At the lower end the walls are 40 ft. wide and have vertical faces, the extra weight being required to withstand the thrust of the mitering gates. At the upper end the walls are 30 ft. wide and have vertical faces. Between the guard gate and the upper gate the width between walls is enlarged by 5 1-3 ft. This will permit removing the upper gate, as it may be swung on its vertical center opposite the recess sufficiently to clear the seat of the emergency gate.

Construction of the lock proceeded from the lower end, where there was the greatest bulk of the concrete. Wooden form sheets, or panels, made up of 2-in. lagging and 4 x 4 in. studs were held in place by rods embedded in the concrete and by wiring across to the forms on the opposite side of the wall.


View of the works at Keokuk, with the new lock and drydock on the right-hand side

Mixed concrete was brought to the site from the mixing plants at the upper end of the power house over industrial tracks in 1½-yd. buckets and then hoisted to place by stiffleg derricks mounted on three improvised railroad trucks. When the height of the wall became too great for handling material from below the derricks were mounted on top of the portion of the wall already completed.

Filling and Emptying System

For filling the locks with water and later discharging it a gridiron of eight 6-ft. culverts extends transversely across the lock from a steel header laid under the river toe of the east wall. Each culvert has seven 3-ft. nozzles. The header is 13 ft. in diameter at the inlet end and diminishes in size as each lateral is taken off. Water enters through four pneumatically operated cylinder valves, 7 ft. in diameter, housed in separate concrete inlet chambers, 19 ft. 8 in. x 10 ft. 6 in. in plan. The centers of the valves are 9 ft. from the back face, giving a clearance of 5 ft. 4 in. Stop-log grooves are provided to permit inspection and repair of the valves.

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*From the Engineering Record.

Each piston is connected to an air cylinder which is supported on the top of the lock by a concrete arch over the chamber. The bonnet, or hood, over the piston rests on two distancers, or pedestals, which in turn rest on a flared inlet casting over the vertical 6½-ft. intake conduit leading to the steel header line. Developed, the clear opening for the passage of water through each valve is 2 ft. 8 in. high by 20 ft. long.

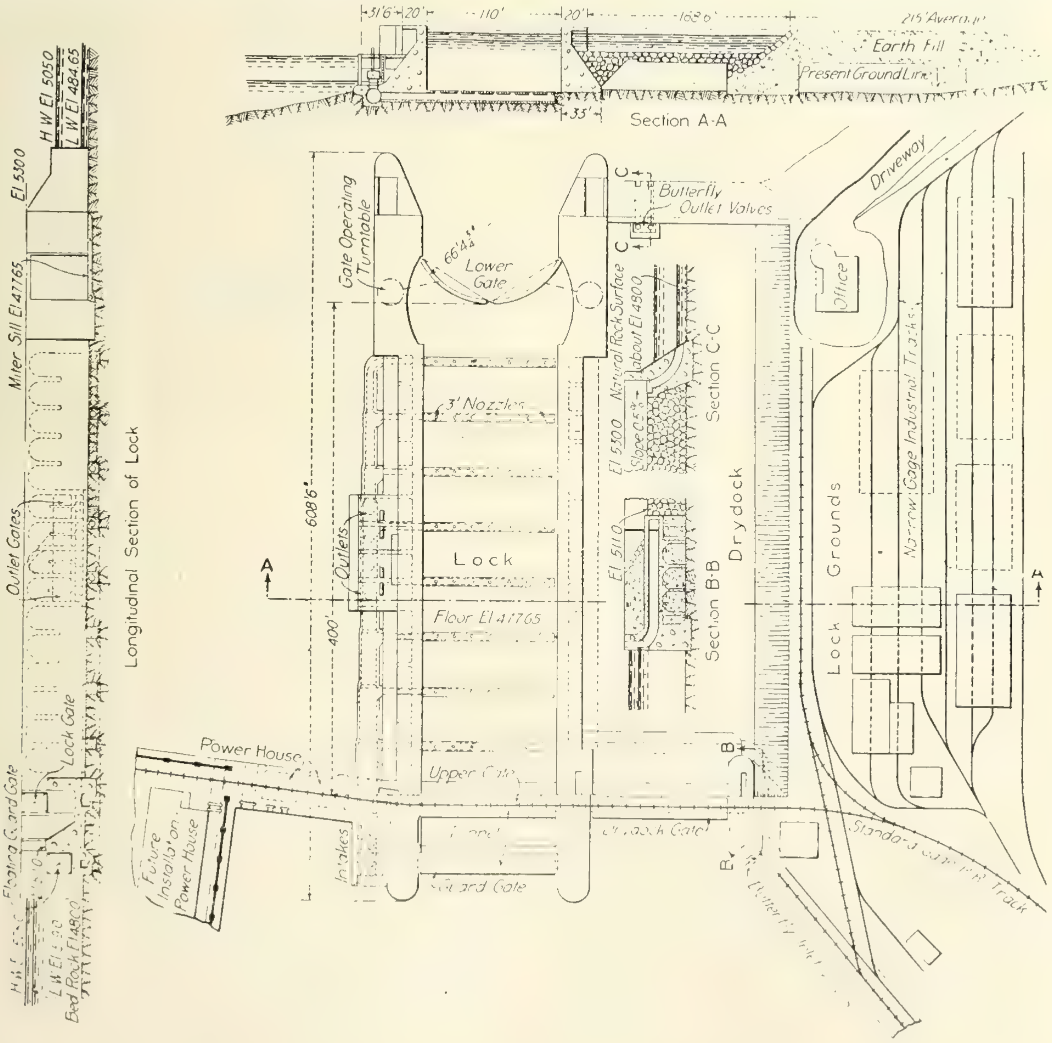
Discharge from the lock takes place through the culvert system to four cylindrical valves, of the same size and type as those at the intake, located in separate discharge chambers near the center of the lock on the outside of the river wall. The valves are set on top of flared nozzels, resting directly on the header, which is 10 ft. 11 in. in diameter at this point. Over the bonnets of the valves are concrete struts, 8 ft. deep and 12 ft. wide, designed to withstand the upward thrust due to the hydrostatic pressure. The operating mechanism is supported on an arched concrete platform over the chambers similar in construction to that at the intake. It is 23 ft. below the top of the back wall and 2 ft. above high tailwater.

Between the normal water level points the lock holds 1,500,000 cu. ft. of water and requires about fifteen minutes to fill. The culvert system is designed to provide a uniform delivery of water throughout the entire area of the lock chamber when filling and an evenly distributed suction when emptying. During the first half of the total time consumed in emptying the lock chambers the water drains down until the difference in head between the level in the lock chamber and the river is about 15 in. The mitering gates and their operating machinery were designed to overcome the usual allowance for wind pressure, and also the pressure due to a difference of 15 in. in water levels. In other words, these gates may be, and actually are being opened against a 15-in. head, thus cutting down materially the discharge period.

Floating Gates

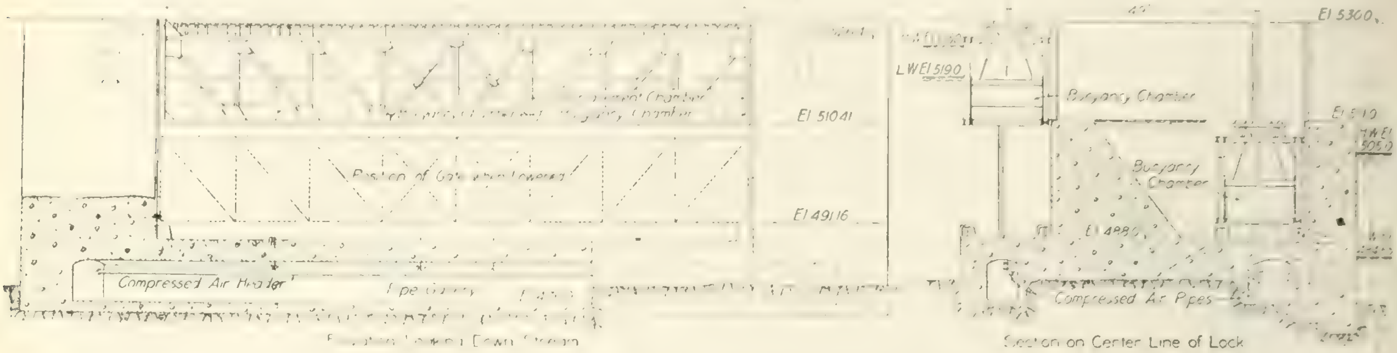
Choice of vertically operated disappearing floating gates was made possible because of the depth of the pool above the lock. There are 31 ft. of water below the sill and a minimum of 8 ft. above it. At high water there are 14 ft. over the sill, above which the skin plate on the back face of the gate forming the water barrier rises 16 ft. Some of the reasons for adopting this type of gate are: First, the structure could be used as a railroad bridge; second, it reduces the length of lock walls over that necessary for mitering gates; third, there is no outward end thrust—in consequence the walls can be made lighter; and fourth, in case repairs are necessary the three gates are interchangeable and any one can be raised and floated out of its recess to the drydock, or to replace either of the other two gates without removing any part, or without assistance other than towlines and barges lashed alongside to prevent turning turtle.

Each gate has an inverted steel box open on the bottom, located centrally, and two closed displacement



Plan of cross-section of lock and drydock.

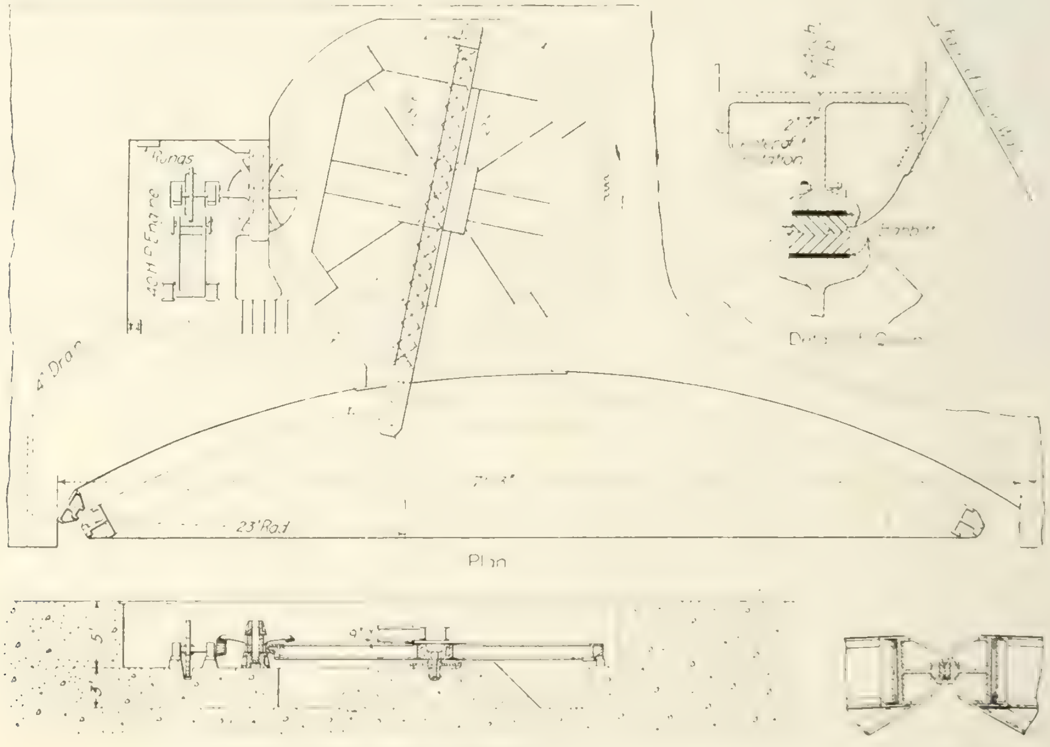
compartments, one at each end. Structurally the gate consists of two vertical trusses, 112 ft. long, spaced on 15-ft. centers, and connected in the plane of the top chords by a horizontal truss and in the plane of the bottom chords by lateral bracing, all in the form of an eight-panel Pratt truss-deck railroad bridge. The downstream truss is, in fact, a plate girder and its web is heavily reinforced to sustain the hydrostatic pressure, thus forming the waterproof barrier of the gate. The resulting pressure along the top chord of this truss is sustained and carried to the lock walls by the horizontal truss of the top of the gate. The bottom chord and the end frames of this girder are fitted with oak contacts which take bearing upon and transmit the pressure to cast-iron sills bedded in the masonry sill and walls of the lock.



Details of floating gate showing location of tunnels, air piping, latches and seats.

Displacement Chamber

The flotation of each gate is by means of two displacement chambers of 4,550 cu. ft. volume and the open bottom buoyancy chamber. The 6,200 cu. ft. volume of displacement in the buoyancy chamber is under the control of the operator, located in a central control house, whereby each gate may be opened or closed—that is, lowered or raised at will. Compressed air is conducted from the lock power house through the pipe galleries to two points under each gate.



Section at Center Line of Turntable

Section of Miter Post

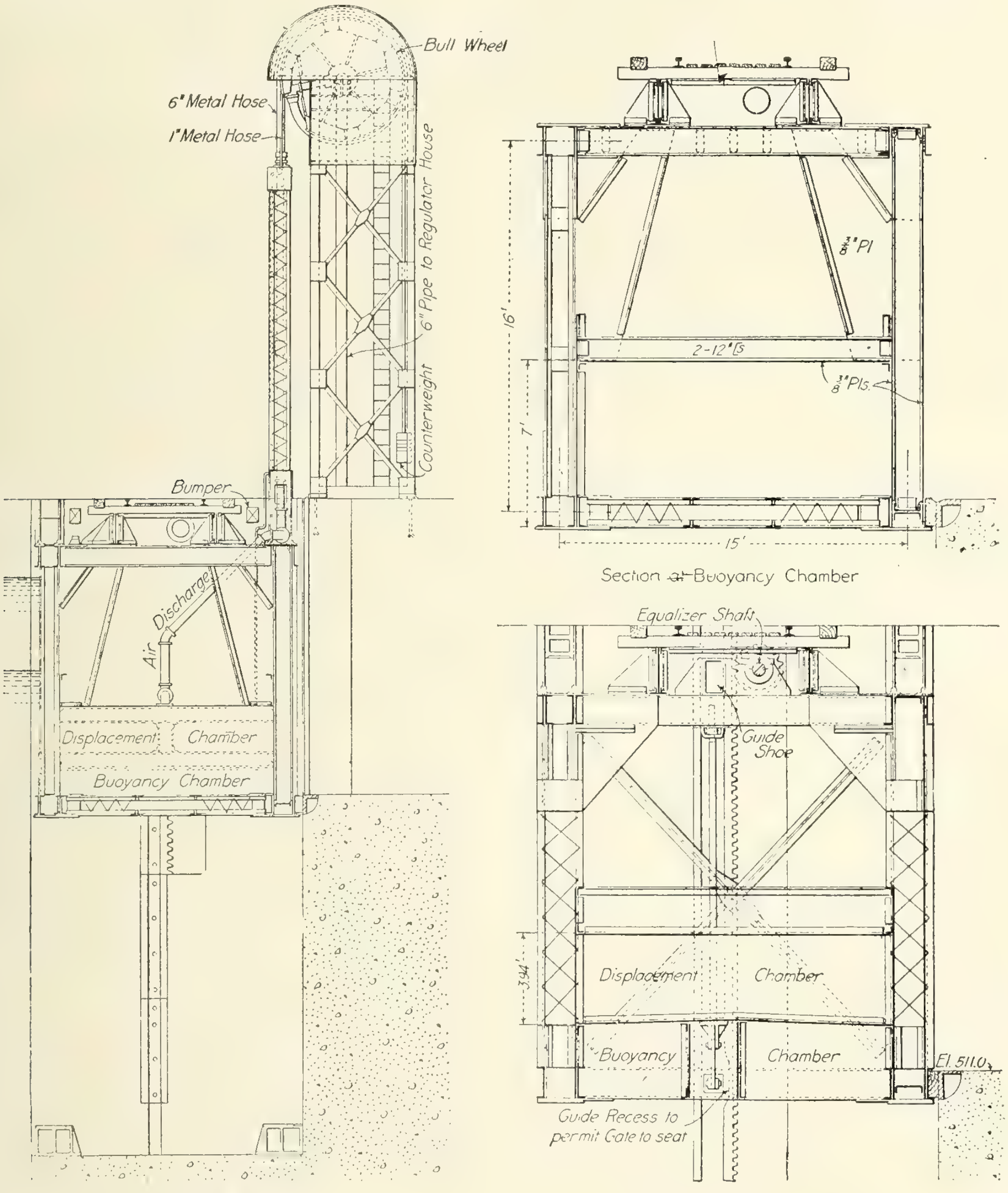
Details of metering gate and its operating mechanism.

The oak bearings along the bottom and ends of the gate are not in contact with the masonry or the reaction castings at any time except when the gate is in a closed position. Each gate is confined to position and to transverse alignment by guide runners sliding in vertical cast-iron guides bedded in the lock walls at each end of the gate. These guides have toothed racks which engage a pinion at each end of the gate, and, as each spur wheel is keyed fast to a shaft which extends from end to end, the simultaneous movement of every part of the gate and its longitudinal alignment are assured.

Each gate is locked in the closed position by four heavy latches, operated pneumatically by a single air cylinder for each pair.

Each gate is proportioned to sustain the hydrostatic pressure due to water at El. 525 on the upstream side with no water pressure acting against the downstream side. The top truss will contain 2,100 lb. per lineal foot uniformly distributed load. This represents the portion of hydrostatic pressure accumulating along the top flange of the downstream girder, which is the same as the bottom chord of the horizontal truss. For the vertical trusses acting as a bridge the dead load is the entire weight of the structure in air, applied equally to the top and bottom chords, when the bridge is supported on the latches. The live load assumed is a continuous train of Cooper's Class E-40 locomotives, with the bridge supported on its latches in air.

Ballast was fixed in the closed chambers to float each gate on an even keel and level longitudinally. The calculated displacement necessary to float the gate when submerged is 6,000 cu. ft. Of this volume there are 4,550 cu. ft. in the displacement chambers, and the remainder is provided by the buoyancy chamber by a depth of 3.87 ft., in which the air pressure varies from 7.4 to 13.6 lb. per square inch, according to the location of the gate between the water surface and the extreme low position.



Detail of Air Discharge

End Section

Floating gate with air discharge and gate-alignment devices.

Air for the buoyancy chamber, under 100-lb. pressure, is compressed in the power house and piped through the tunnels under the gates. Two 4-in. risers pierce the roof of the tunnels and discharge into the water through which the air bubbles up under the gate and is trapped.

Discharge of air from the buoyancy chamber is from one point near the center through a 6-in. main carried to the end of the gate and upward through a latticed end-post extension leading to a 6-in. metal hose wound on a bullwheel 8 ft. in diameter. Seven-eighths of a turn of the wheel equals the travel of the gate. The inner end of the hose is connected to the hollow shaft on which the wheel turns. The outer end of the shaft connects with a 6-in. pipe leading to an opening in the lock wall by way of the operator's house, where control is effected.

In a similar manner, the bullwheel carries a 1-in. pipe to supply compressed air to the closed chambers for the purpose of removing any leakage through suitably arranged sumps and check valves.

Before lowering the gate air is first let into the buoyancy chamber to raise the gate so that the latches may be removed. There is a permissible upward movement of 9 in. when four bumpers with rubber cushions are encountered. The outlet valve on the air line passing over the bullwheel is then opened and the gate sinks, slowly and under perfect control, to open position. In this downward movement additional air is admitted after the gate is submerged to compensate for the elastic displacement in the open bottom compartment. This gate travels through 19 ft. vertically, and while its movement is kept slow for safety, the change from open to closed position, and vice versa, is accomplished in remarkably quick time.

The Mitering Gates

At the lower end of the lock are steel mitering gates, 48 ft. high center to center of extreme arch ribs, 66 ft. 4¾ in. long, center to center of contacts, and 10 ft. 8½ in. in extreme thickness. A displacement chamber at the lower central portion of each leaf supports a large part of its dead weight.

Each gate leaf consists of thirteen arched ribs framed together from top to bottom of the leaf by girders forming the quoin and miter posts and by nine lines of intermediate framing. The quoin and miter posts are further reinforced and pressure from the arch ribs is distributed by cast-steel castings in a continuous line from top to bottom. This frame is covered on its convex side by steel plates. The curved shell of the leaf thus formed is reinforced by heavy steel X-bracing on its concave side, designed to sustain the entire dead weight of the leaf and to prevent warping of the leaf under any circumstances, with particular reference to the power applied eccentrically at the top to open the gate against a 15-in. maximum head of water.

Five conditions of loading were assumed. Case 1 is for the dead load of the gate leaf when hung on its hinges in air. In case 2 the dead load is considered when the leaf is hung on its hinges in maximum high water, thus giving the maximum uplift from the buoyancy chamber. Case 3 is with the gates closed and subjected to sufficient power applied at the top to open them against a 15-in. head at low stage. Case 4 is with the gates closed and subjected to static water pressure, when the lock chamber is filled to El. 525 and tailwater is excluded from contact with the gate, also with contact on the miter post, but not on the miter sill. Case 5 is the same as case 4, with the exception that contact is considered on both miter sill and miter post.

Operation of the mitering gates is by machinery similar to that in use at Panama, except that the motive power is compressed air. The 25-ft. turntable and the strut attached to the gate leaf about one-third of the distance from the bearing are shown in one of the illustrations. The reduction in gearing from the 40 h.p. reversible air-driven engine to the wheel is 1 to 700. One-half turn of the turntable opens or closes the gate, so that gear teeth are provided for only a little more than one-half the circumference. The connecting rod, or operating strut, is provided with a double acting spring to absorb shock from the engine or that due to the meeting of any obstruction of the gate when sustaining water pressure. One-inch movement each way from normal is controlled by this spring. Due to the angles and leverage, this is equivalent to a 4-in. travel at the mitering face, so that an 8-in. block of wood could be caught between the mitering faces and do no damage.

Over the miter post on one leaf is a pneumatic miter forcing machine which seizes a post on the opposite leaf in a pair of giant jaws and lines the faces against each other.

The turntable is equipped with an electrical contact so wired that successive positions of the gate are indicated by electric lights on the control board in the operator's house at the far end of the lock. Five inches beyond the dead center a four-way limit cock, the handle of which is guided by a cam on the wheel, reverses the engine by means of an air cylinder controlling the reverse lever. The wheel will continue to oscillate back and forth 5 in. each side of the dead center until the operator shuts off the main air supply. At this point the gate movement is so small that the miter-forcing machine can operate with the turntable stopped anywhere inside of the 5-in. limit.

Setting the cast-iron reaction blocks in concrete was accomplished by erecting a temporary structural-steel post in exact position, bolting the blocks to this post and then placing the concrete.

Anchorages at the top of the quoin post comprise two sets of double 2 x 8-in. eye-bars. One is shown in the drawing in elevation and the other is at right angles to this.

All steelwork for both floating and mitering gates was fabricated by the Chicago Bridge & Iron Works.

Fitting the Miter Sill

Not until the gate had been completed and swung into closed position was the 12 x 12-in. oak miter sill fitted. First, the oak piece was slipped over the horizontal bolt connections, leaving 3 in. for fitting against the back and bottom surfaces. Second, wooden struts were applied against the gate with a force equal to 150 tons uniformly distributed over the bottom of each leaf. Third, the oak pieces were forced tight against the cast-steel contact castings and held there by wooden wedges until the concrete deposited around the sill had set. Fourth, vertical bolt holes were bored through the sill and drilled into the concrete, fox bolts were placed and the nuts screwed tight. For renewals the vertical bolts are to be cut off and new holes drilled.

To make sure that the holding-down bolts grip the bed rock after the concrete forming the sill had set, the 2-in gas pipes around the bolts were not grouted until the bolts had been subjected to an initial stress of 15,000 lb., accomplished by a 150-lb. pull at the end of 3½-ft. wrench.

Lock Power House

Located in the wall connecting the upper end of the lock and the lower end of the power house are two 200 h.p. S. Morgan Smith single-runner Francis turbines, which are belt-connected to Ingersoll-Rand 13 x 16-in. air compressors, and are controlled by Lombard governors. Each unit alone has sufficient capacity to operate the lock and drydock machinery and drive the equipment housed on the lock grounds. From the engine room stairways lead to tunnels carrying the air piping and electric cables under the lock and drydock gates.

Built last is the 150 x 463-ft. drydock, as it is located over the former lock, Government headquarters and reservation. The site is now being filled in to conform to the general drawing. On the river side is the lock wall, while on the downstream side a concrete gravity wall extends from the lower end of the lock to the embankment of the lock grounds and on the upper side is an extension of the concrete gravity sea wall along on top of this latter wall leads over the gates for the drydock and lock to the power house. Two hand-operated butterfly valves, 6 ft. in diameter at the upstream end and a similar set at the downstream end are provided for filling and emptying the drydock.

On the drydock grounds the U. S. Government will erect a paint house, machinery and blacksmith shops, carpenter shop, sawmill and storehouse—all connected by industrial tracks as well as by standard-gage switches to the railroad. Power to operate the machinery located in these buildings, at the lock and at the drydock is to be compressed air.

Tests of Waterproofing in Cement*

By Cloyd M. Chapman, Engineer in Charge, Westinghouse, Church, Kerr & Co., New York

SO much that is contradictory has been said and written concerning various methods of producing concrete which is waterproof, and so much has been claimed by the vendors of various compounds which have been offered to the public as a positive solution of all waterproofing problems, that it is not surprising that not one cement user in ten has any definite or fixed opinion as to how to meet the problem of producing a waterproof concrete. There seem to be as many opinions on the subject as there are men willing to express their opinions. And the many methods which have been used differ greatly from each other. They are not all bad, for some of them have been very successfully applied. They are not all good, for many failures have occurred. Every little while a new preparation is offered or a new method is advocated. There seems to be no strong tendency toward any one method of producing a waterproof concrete. Perhaps the reason for this continued uncertainty and diversity of opinion among cement users may be found in the very fact that many of the multitude of methods advocated have, in certain instances, proven successful and each success makes converts to the method used. In many cases where special compounds have been added to a good, well proportioned concrete made of properly graded materials, there is little doubt that the result would have been satisfactory if the special compound had been entirely omitted. In other cases where the concrete is made of materials not wholly adapted to the purpose, an addition of a suitable filler or special compound would have produced the desired waterproof qualities.

To throw more light upon the effectiveness of the various methods of waterproofing concrete, a great many tests have been made by numerous investigators. The methods used by these experimenters have ranged from absorption tests to high pressure tests necessitating more or less elaborate apparatus.

The absorption or non-pressure tests are made by preparing specimens of any predetermined size and shape of the concrete waterproofed by the particular methods under investigation. After the desired age is attained these specimens are either immersed in water completely, or immersed almost completely, or placed in shallow water so that the bottom only of the specimen is wet; or the specimen may be made cup shaped so that the water may be placed in the depression in the specimen, or a container for the water may be attached to the surface of the specimen. The two last mentioned forms of tests have been extensively used in the laboratory of Westinghouse, Church, Kerr & Co.

In all of these forms of tests the results are expressed in terms of the amount of water absorbed, or the rate of absorption.

In the pressure tests the specimen is either so made that the water pressure may be applied to the interior of the test piece, or it is so made that it may be inserted in the apparatus in such a manner that the water pressure may be applied to a certain area on one face of the test piece. In this form of test the results are expressed in terms of the amount of water passing through the specimen or the rate of flow through it.

Both of the above classes of tests are very valuable if carried out in such a manner that the results may reasonably be expected to compare with results which may be obtained in practical work. To this end it is desirable that certain precautions be observed in preparing specimens and conducting tests so that the results shall not be misleading or deceiving.

It is the purpose of this paper to call attention to some of the features of tests of this class which should receive particular attention and to emphasize more strongly certain precautions, failure to observe which may cause some of these tests to give very deceptive data. These precautions apply particularly to tests made for the purpose of determining what method shall be used on a particular piece of work in the field. Some of them do not apply to tests designed only to compare the relative efficiency of various methods without regard to any particular work at hand.

Precautions

First: The selection of the materials to be used in making up the test pieces. These should be selected from those available at the site of the work which is to be done. This is particularly true of the fine and coarse aggregates. It has more than once happened that tests made with suitable aggregates have shown a particular method to give a waterproof concrete but the same treatment failed when the aggregates available in the field were used. If, therefore, it is desired to determine by test how to produce a waterproof concrete for a particular job, the materials available at the job should be used in making up the test pieces. It is also important in connection with the selection of aggregates that there be secured a sufficient quantity of the materials to be used to conduct the entire line of tests contemplated so that there need be no change in the materials used.

Second: The proportioning of the materials. This should be done with a view to determining the proportions to be used later on the work. The proportions to be used on the job should be used in the tests. There is little use in testing only a 1:2:4 concrete for watertightness and then use 1:2½:5 on the job.

Third: The mixing of the materials. This should duplicate as nearly as possible the mixing to be used on the work. Many a well-mixed concrete has proven waterproof which would have failed utterly if carelessly mixed. There is liable to be a tendency to very thoroughly mixing on the job.

Fourth: The consistency of the mixture. This should be carefully considered because of its influence upon the results. A consistency should be chosen which it is practical to use on the job under the circumstances prevailing there. For instance, it is useless to test a concrete of so thick a consistency that it would have to be spaded into the forms, if, on the job, the concrete is to be spouted from the elevator and therefore necessarily of a much thinner consistency than was used in the test.

Fifth: The moulding of the test specimen. This process should imitate as nearly as possible the filling of the forms as it will be done on the job. To make a test piece by putting into the mould a small quantity of concrete at a time and constantly tamping during the filling process would probably produce a deceiving result.

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*The Cement Era

Sixth: The finishing of the surface to be tested. This is one of the most important points in the preparation of test specimens. The condition in which that surface which is to be subjected to water is left, has a very great influence upon the results obtained. For instance, it is quite possible by means of a little troweling to produce a skin or surface coating of nearly neat cement. This will produce a dense surface much more impermeable than the body of the concrete and show results far superior to an untroweled specimen of the same concrete. It is recommended that specimens be so prepared that the surface exposed to test truly represents the body of the concrete. This may be accompanied by removing the surface of the specimen after the concrete has hardened by means of a wire brush or by chipping or breaking off the surface before test.

In the case of absorption tests, this may be done with a stiff wire brush when the specimen is about 24 hours old. In the case of the pressure tests, only that portion from which the water passes out of the specimen needs to be removed. This may be accomplished by making the test piece with additional material added to the surfaces to be tested so that this additional concrete may be broken off after the specimen has hardened and before the test is performed. Unless some such precaution is taken, tests of this character are liable to show the efficiency of the surface of the specimen in resisting the water pressure rather than the value of the mass of the concrete in performing the same function.

One suitable form for a specimen for pressure tests is in the form of a central disc of suitable diameter and thickness. The outside surface and the outer portion of the two faces of this disc are moulded smooth and regular so as to fit the receptacle or holder into which it must be placed in order to apply the water pressure to a definite and restricted area of its surface. From the central portion of the two faces of this disc project truncated cones whose smaller diameter is just equal to the diameter of the circle which is to receive the water pressure. After the specimen has hardened and is ready for test, the two truncated cones are broken off with a blow of a hammer, leaving a disc.

By this method there is exposed to the water pressure a freshly broken surface of concrete which has not been subjected to troweling or other influences tending to alter the natural condition or distribution of the constituents of the concrete. This freshly broken surface is not only presented to the water on the side to which the pressure is applied, but is also provided on the opposite side where the water leaves the specimen. The test, therefore, is made on a certain thickness of concrete taken from the interior of the specimen and the results are not influenced by the method of finishing these two surfaces.

There are, of course, cases in which it is the surface permeability that it is desired to test, and in such cases this form of specimen is unsuitable. But in all cases in which the watertightness of the concrete mass is to be determined the above type of specimen is much to be preferred.

There are also variations of this form of test piece which will accomplish the same result. Any method which removes the finished surface from the area to be tested is to be preferred to one which does not remove that surface.

Even in such cases as those in which the specimen is moulded on a surface of glass or other smooth material and no troweling is done, there is a concentration of cement and fine aggregates next to the surface which must affect the results obtained if this richer layer or skin is not removed before test.

Seventh: The curing or ageing of the specimen. This matter should also be decided with a view to conditions which will prevail in the field when the real work is done. If it is impracticable on the job to keep the concrete constantly wet for a considerable period, then the test specimens should not be stored in water. If the only wetting the work in the field is to receive is the water contained in the concrete when it is placed, then the test pieces should receive no additional water after moulding. On the other hand, they should not be allowed to dry out any faster than would the work in the field, as they would doubtless do owing to their comparatively small size if kept indoors in a laboratory and no precautions taken to regulate the drying process.

The specimens have now reached the stage when they are ready for whatever tests are to be applied to them and the methods used in performing these tests are so varied that the limited scope of this paper will not permit an extended discussion of them. Those with which the writer is familiar appear to be open to little, if any, criticism. One of the most important features is that the conditions adopted shall remain constant throughout the test.

If the test is an absorption or a non-pressure test, the immersion or partial immersion should be under uniform conditions and for definite lengths of time in clean water. If the test is a pressure test, the pressure should be kept constant, the water clean, and the method of measuring the water passing through the concrete accurate. As the area subjected to pressure is usually small, and the amount of water passing in correspondingly small, in some cases where the measurement of the water is made by collecting the drippings from the underside of the test piece the element of evaporation may greatly affect the results. A form of apparatus in which the amount of water passing into the specimen is determined eliminates this error.

In this form of apparatus the specimen is clamped and sealed to a metal cap which is provided with a projecting, vertical graduated glass tube. The cap and the tube are filled with water, and air pressure is then applied to the top of the tube in any desired amount.

Time Element

Another matter in connection with tests of waterproofings for concrete which seems to have had but little attention paid to it, is the effect of time and the elements upon efficiency of the waterproofing materials. In practically all of the numerous tests of waterproofings made in the past seven or eight years in the laboratory of Westinghouse, Church, Kerr & Company, it has been the custom to expose the test pieces to the action of the weather on the roof of their office building, after first testing them, and then testing again after six or twelve months' exposure. The results of these tests after prolonged exposure show that few, if any, of the materials which are applied to the surface of concrete to waterproof it after it is made, will retain even a fair proportion of their efficiency. In the case of those methods by means of which the entire mass of the concrete is designed to be waterproof, there is shown sometimes a steady improvement after exposure and sometimes a marked decline. In some cases the life of the treatment is very short and the failure after a few months' exposure almost complete.

Personal Mention

Mr. C. J. Gibson, architect, Toronto, has moved from the James Building to the Webster Building at 53 Yonge street.

Messrs. R. K. Shepard and D. D. Calvin, architects, have opened offices at 43 Scott street, Toronto, under the name of Shepard & Calvin.

Mr. J. W. Siddall, architect, Toronto, has moved his offices from the Janes Building to room 250, Confederation Life Building.

The Toronto office of the International Engineering Works, Limited, has been placed under the managership of Mr. E. F. Bradley.

Messrs. Bond and Smith, architects, are now located in their new quarters in the Imperial Optical Company building, 13 Wilton Avenue, Toronto.

The Metals Chemical Company, Welland, Ont., ore smelters and refiners, has recently appointed Mr. K. S. Maclachlan, B.A.Sc., to the position of superintendent.

Investigations into Toronto street railway traffic conditions are being conducted by Mr. Bion J. Arnold, of Chicago. Mr. Arnold is assisted by Mr. G. W. Moyes, of Toronto.

The City of Edmonton, Alta., has called into consultation concerning the site of the proposed filtration plant, Mr. Willis Chipman, of the firm of Chipman & Power, Toronto.

Arthur H. Blanchard, M. Can. Soc. C. E., Professor of Highway Engineering in Columbia University, has been retained as Consulting Highway Engineer by the Department of Efficiency and Economy of the State of New York.

Mr. Adolphe Levesque, a well-known ecclesiastical architect, died in Montreal, aged 86. Mr. Levesque designed a very large number of Roman Catholic churches and schools, and was also consulting architect for the Dominion Parliament Buildings, Ottawa.

Prevost Hubbard, in Charge of the Division of Roads and Pavements of the Institute of Industrial Research, Washington, and Lecturer in Engineering Chemistry in Columbia University, has been retained as Consulting Highway Chemist by the Department of Efficiency and Economy of the State of New York.

Mainly Constructional

The News in Brief—From Coast to Coast

Kitsilano, B.C., is to have a new institutional Methodist Church erected at a cost of $200,000.

The new government elevator, to cost $1,250,000, is being rapidly constructed by the contractors at Port Arthur,

The total expenditure of the Montreal roads department last year was $3,018,000 of which the sum of $1,755,304 was for public works. One-half of this amount was for street pavements.

The Waterloo Cement Machinery Corporation, 117 Vinton Street, Waterloo, Iowa, have opened an office at 127 Coristine Building, Montreal. Mr. G. O. McDonell is in charge.

The Montreal Council have served notice on the Montreal Water & Power Company that at the expiry of six months' time they will enter Court proceedings to acquire the company's plant in St. Henry Ward. The Company object to the acquisition of their property piecemeal, and will fight the case.

The work of erecting the superstructure of the Atlantic Sugar Refineries, Limited, building, St. John, N.B., has begun. The plant is to be erected at a cost of one million dollars. It is expected that the steel for the first building will be in place by the end of August.

The city of Saskatoon, Sask., and the provincial Government of Saskatchewan are jointly interested in construction of a bridge at 25th Street, Saskatoon. Details as to the tenders and concrete work are being arranged. The cost will approximate $500,000.

The Allis-Chalmers Manufacturing Company through the Canadian Allis-Chalmers, Limited, Toronto, has just issued a neat little bulletin describing the Allis-Chalmers friction clutch couplings and pulleys. The booklet is very neat in design and contains a number of illustrative cuts and much information succinctly told. The bulletin is No. 4032.

Nearly 200 men are now engaged on the work of increasing the site of the terminal facilities of the C. P. R. at Moose Jaw, Sask., on which more than $100,000 is to be spent. In connection with the improvements, the trackage is being increased approximately fifteen miles. The double-track line from Swift Current into Moose Jaw is also nearing completion.

The Pennsylvania Railway has undertaken the gigantic task of eliminating 13,000 level crossings found on their system. The estimated cost of this scheme is $600,000,000. The company proposes to divide the work over a period of fifty years, reconstructing 200 crossings each year. The saving over the fifty years in accident expense and repair bills will go a long way toward paying the capital cost of the changes.

Twenty-five thousand men are now at work on the steel which will bind British Columbia and the western provinces with the Atlantic outlets on the east when the Canadian Northern Transcontinental line is completed next spring. Of this number nine thousand are working on the line east of Port Arthur and sixteen thousand on the line in Western Canada.

The Quebec Board of Trade has forwarded a memorial to the Minister of Public Works advocating the establishment of a modern steel shipbuilding plant at Levis in connection with the new drydock to be built by Messrs. M. P. and J. T. Davis. The memorial points out that in order to ensure the proper working of the dock it will be necessary to maintain a staff of competent shipbuilders and ship repairers and that these men must have constant work.

The Dominion Dredging Company, of Ottawa, is arranging to start work on section one of the new Welland Canal within the course of a few weeks. The contract papers are now being executed. The company is well equipped with a fleet of dredges of large capacity. The equipment will be taken up to the Welland Canal from the Quebec yards of the company at once and the work started with a view to early completion.

One of the new clauses in the city of Hamilton building by-law makes it compulsory for every room to have a window at least ten per cent. of the area of the floor space opening inside. Every private house is also required to have a backyard of depth corresponding to the height of the house, so as to provide air space necessary. An effort is made also in the measure to provide adequate fire protection, and to compel ample light and ventilation in every building hereafter erected in the city.

The Toronto and Canadian Lands Company, of London, England, has purchased 100 acres of land between stops 23 and 25 on the Kingston Road, near Toronto, and will erect from twenty to twenty-five workingmen's homes. Three houses have been started on this land already, and the new owners expect to have over a score completed by the close of this fall. The houses to be put up will cost from $2,500 to $3,000 and will be built in any architectural style desired by the purchasers.

Word has also been received from the provincial government at Regina that everything is in readiness for the commencement of operations on the new court house and land titles office for Humbolt, Sask. The plans have been finally approved and it is intimated that building operations will commence right away so that the buildings may be completed this year. The entire premises will be included in one building and the estimated cost is about $150,000.

The C. P. R. has been notified of the completion of the new freight building at the Fort William steamship drydock. The new building is a double-deck structure, nearly a thousand feet long. The upper storey is for the reception of freight by rail and the lower for freight unloaded from vessels and to be loaded on cars. For the unloading of rail freight there is a trestle along the rear of the building of sufficient height to bring the cars to the proper level, Along this side are 19 doors, spaced for freight car openings.

Skilled workmen temporarily employed by the public works department of the city of Montreal are to be paid an increase of 5 per cent. First-class street pavers will receive 48 cents an hour; second-class, 42 cents; third-class, 37 cents, and fourth-class 32 cents. First-class block pavers are increased to 48 cents, and the second class man to 42 cents. Cement finishers are to be paid 42 and 37 cents an hour, while the different classes of foremen are to be paid, 42, 39, 37, 32 and 27 cents, and superintendents of permanent works 48 cents.

A force of about 200 men is now employed on the Sooke Lake development project. The various gangs are busy clearing the site of the proposed works at the south end of Sooke Lake, and on the spot where will be constructed the big 130,000,000 gallon reservoir at Humpback. Men are also engaged at erecting temporary trestles, installing the plant recently secured from the liquidator of the Westholme Lumber Company, and making ready for the active prosecution of the work. The amount already expended on this scheme is nearly $1,000,000.

Mr. E. G. M. Cape, of Montreal, has lately secured three of the largest contracts in Eastern Canada. He is building the Atlantic sugar refinery at St. John, N.B., at a cost of about a million dollars, while he has just secured the contract for a new factory for the Imperial Wire & Cable Company, Montreal. This will be one of the finest factories in Canada. Mr. Cape has also commenced operations on the steel plant of Armstrong-Whitworth & Company, Longueuil, P.Q. The first building is to be 500 feet by 150 feet and 25 feet high, and of iron and cement.

The contract for the main building of the new Toronto Barracks at Long Branch will be awarded in a few days, and it is expected that work will be well under way by September. The buildings to be erected under the first contract include the main barracks for the men, the stable, the officers' mess, the dining hall and the recreation building. Accommodation is planned for 1,200 officers and men, the idea of the department being to eventually move the London and Kingston permanent corps to Toronto, in the interests both of economy and efficiency. The new barracks at Toronto will cost when completed over one million dollars.

There is a possibility that the provincial authorities will be asked to assume control of the Burrard Inlet Tunnel and Bridge Company, and to build the proposed bridge over the Second Narrows as a provincial enterprise. The revised estimated costs of the structure furnished by Sir John Wolfe Barry and his associates, who have prepared plans for the bridge, place the expense at $2,450,000 with an additional $100,000 for contingencies. The stock subscribed at present aggregates $1,500,000, leaving a difference of more than $1,000,000, The revised plans and report from the company's engineers in England show that the cost of the bridge, with the changes necessitated by the difference in the height and grades, the substitution of steel throughout instead of timber and piles—points strongly urged by Sir John Wolfe Barry—will mean a greater cost than originally expected. The preliminary estimates placed the cost of the bridge at $2,303,000 exclusive of approaches and other extra charges.

A New Canadian Plant

The B. F. Sturtevant Company of Canada, Limited, has arranged for the establishment of a plant at Galt, Ont., and from this plant will handle the Canadian business, together with the export to England and Australia and other countries. The company will start work immediately as the property acquired is of such a nature that they can begin manufacture at once, as well as the assembling of parts manufactured by the B. F. Sturtevant Company of Boston. Provision is being made for an increase in the plant as business develops. Salesmen are already located to cover Montreal, Toronto and Vancouver sections and offices will be established in each of the principal cities of Canada. The manufacturing, engineering and sales will be handled by men trained by the B. F. Sturtevant Company, of Boston, and the general policy of that company in manufacturing high-grade material will be carried out. Some of the more important apparatus which will be manufactured are fans and blowers, planing mill exhausters, propeller fans, heating and ventilating apparatus, fuel economisers, mechanical draft, steam turbines, vertical engines, generating sets and stokers.

Addition to Power Plant

The position occupied by the Canadian General Electric Company, Limited, in the design and construction of hydroelectric power machinery is well shown in the contract recently awarded by the West Kootenay Power and Light Company, of Rossland, B.C. In order to increase the capacity of its plant the latter company decided upon the addition of a 7,500 k.v.a. water wheel driven generator. The Canadian General Electric Company, Limited, will build the generator, while the contract for the water wheel was placed with the subsidiary Canadian Allis-Chalmers Ltd. This water wheel will have a capacity of 9,000 h.p. at 180 r.p.m. under a head of 70 feet. The contract therefore will be carried out practically by one firm who are thoroughly familiar with the design and construction of both the electric and hydraulic portions and with the conditions necessary for their successful operation as one unit.

It is understood that the increase in the generating capacity of the West Kootenay Power and Light Company has been undertaken in anticipation of the electrical requirements of the Canadian Pacific Railway which intends to electrify the line between Rossland and Castlegar. The contract for the electrification of this section of the railway was also awarded a short time ago to the Canadian General Electric Company, Limited.

A bridge 769 ft. in length is, says the Railway News, to be built over the Pazundaung Gorge on the extension of the Burma Railways. The work is being undertaken in order to link up the riverside districts of Rangoon. The structure will comprise three fixed spans of 165 ft. each, a rolling lift span to give 100 ft. clear opening for water traffic, and an approach span of 120 ft.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Waterworks, Sewerage and Roadways

Cayuga, Ont.
Tenders received by Clerk, T. A. Snider, K.C., until August 16th for 26½ miles of stone macadam road. Plans at office of engineers, Jackson & Kyd, Dunnville.

Guelph, Ont.
Storm sewers contemplated by City Council. Secretary, T. J. Moore. City Engineer, M. Ferguson. Plans drawn.

Milestone, Sask.
Concrete reservoir for C. P. R. Div. Engineer, T. Martin, Moose Jaw. Engineer in charge, W. T. Daniels, resident engineer, Regina. Tenders received by W. T. Daniels till August 31 for supply of labor, material, etc., for erection of a reservoir for water supply 40,000 cu. yds. Plans, specifications, etc., at either engineer's office.

McKillop Twp., Ont.
Tenders received by Clerk, M. Murdie, Winthrop, Ont., until Aug. 13th for extension of the Holland and Dodd drains into Hullett Twp.

Melville, Sask.
Sewerage system planned by Town Council. Mayor, C. L. Franks. Sec.-Treas., F. H. Clarkson. For disposal works and septic tanks. Engineer not yet appointed.

Ottawa, Ont.
Pavements and walks, cost $250,000 contemplated. Mayor, J. A. Ellis. Engineer-in-charge, Archibald Currie. Concrete sidewalks, asphalt, rocmac, tarvia X and B, passed by Board of Control.

Tenders will be called this week for asphalt pavements on Rochester, Somerset to Ellen, and on Centre, Bank to Craig. Cost $40,000. Mayor, J. A. Ellis. Engineer, Archibald Currie, City Engineer.

Richmond, Que.
Town Council has applied to the Provincial Government for loan of $39,780 to be used to macadamize Main St., Craig and Spooner roads. Mayor, A. Brock.

Sandwich, Ont.
Paving, cost $5,000, planned by Town Council. Mayor, Ed. Donnelly. Tenders received by Clerk, E. N. North, from Aug. 5th to 15th, 1,000 sq. yds. of concrete pavement.

Toronto, Ont.
Paving, etc., cost $92,000, planned by Board of Control. Mayor, H. C. Hocken, City Hall. Road improvement, etc., in the Exhibition grounds.

Pavement, cost $6,000, in connection with Street Railway track on Louisa St. Extension, planned by Board of Control. Mayor, H. C. Hocken, City Hall.

Sewers, planned by Board of Control. Mayor, H. C. Hocken, City Hall. Tenders received until Aug. 19th. Plans at office of Commissioners of Work. Midway sewer system outlet via Hiawatha Ave., Gerrard St. and Morley Ave. Division No. 2 West Toronto. Woodville Ave., Balsam Ave., Queen to Kingston Road. East Toronto Section A outlet.

West Zorra Twp., Ont.
Tenders received by Clerk, Allan Murray, Embro, until Aug 12th, for drains and catch basins.

Winnipeg, Man.
Tenders received by Chairman Board of control till August 7 for concrete pavements on lanes between Ruskin Row and Wellington Cres., Park Rd. and Kingsway, Grosvenor and Yale avenues, Stafford and Harrow streets, Dorchester and McMillan avenues, Amelia and Guelph streets. Specifications at office of Engineer, H. N. Ruttan, 223 James avenue. Secretary Board of Control, M. Peterson.

Sewer planned by Board of Control. Sec., M. Peterson, in Winnipeg Ave, from Flint to Campion St. Specifications at office of Engineer. Tenders received by Chairman Board of Control till Aug. 6. Engineer, H. N. Ruttan, 223 James Ave.

CONTRACTS AWARDED

Ottawa, Ont.
Pavements. Mayor, J. A. Ellis. Engineer, Archibald Currie, City Hall. Roadway engineer, L. McL. Hunter. Approximately 9,000 yds. asphalt, including curb and gutter, etc., awarded to Ottawa Construction Co., Central Chambers. 3,500 yds. asphalt on Spadina and Clarence awarded to city, to be done by day labor.

Sandwich, Ont.
Paving, cost $26,000. Mayor, Ed. Donnolly. Engineer, Owen McKay, Walkerville, Ont. Town Clerk, E. R. North. General contractor, Thos. Chick, Windsor. 16,000 sq. yds. of concrete pavement.

Welland, Ont.
Concrete walks planned by Plymouth Cordage Co. General contractors, Somerville & Reid, Welland. 10,425 sq. yds.

Winnipeg, Man.
The Dominion Construction Co., 290 Selkirk ave., general contractors for sewer in Lansdowne from west line of Lot 14, Block 6, Pl. 1262 to McGregor street. M. Peterson, secretary Board of Control. Engineer, H. N. Ruttan, 223 James ave.

Reservoir, cost $12,700, for Manitoba Agriculture College, St. Vital. General contractors, Des Moines Bridge & Iron Works, Des Moines, Iowa.

Railroads, Bridges and Wharves

Brantford, Ont.
Tenders received by Ald. S. Suddaby, until Aug. 7th for construction of sluiceway dam and building, concrete pier and abutment. Cost $4,000. Specifications at office of Engineer. City Engineer, T. Harry Jones.

Galt, Ont.
Concrete dam contemplated by the Town Council. Clerk, Jos. McCartney. Plans will be prepared.

Haney, B.C.
Canadian Pacific Railway Company has been authorized to construct spur for Abernethy & Lougheed Ltd., in Lot 398, Sec. 12, Twp. 12, N.W.D., Haney, B.C.

Hope, B.C.
Railway for the Kettle Valley Rly. Co. President and general manager, J. J. Warren, Penticton, B.C. Tenders called for line from Coquahalla Summit to Hope, on the Fraser River, a distance of 60 miles.

Little Current, Ont.
Dredging, for Dom. Govt. Dept. of Public Works. Tenders received by Secretary, R. C. Desrochers, Ottawa, until Aug. 12th, 4 p.m. Specifications, etc., at Dept., Ottawa.

Meadowvale, Ont.
Canadian Pacific Railway Company has been authorized to construct bridge No. 292 over Toronto Suburban Railway near Meadowvale, Orangeville Sub-Div.

Montreal, Que.
Viaduct, cost $5,000,000, contemplated by G. T. R., City to pay share of cost. Matter to be decided upon in a month or six weeks.

Widening aqueduct, for Board of Commissioners. Sec., L. N. Senecal. Cook Construction Co., Sudbury, Ont., may be communicated with, c/o Canadian Railway & Contractors Supply Co., 248 St. James St., Montreal, and will open an office in New McGill Bldg., about Aug. 1st.

Underground conduits, on Bleury and Park Ave., and St. Catherine, Guy to Atwater, planned by Board of Commissioners. Sec., L. N. Senecal. Architects, Elec. Service Commission, New Birks Bldg., 10 St. Catherine St. Engineer-in-charge, Dr. Herdt, McGill University. Plans approved.

New Hamburg, Ont.
Bridge, for Co. of Waterloo. Engineers, Bowman & Connor, Toronto and Berlin. Tenders close Aug. 8th. (1) 35 ft. concrete at Hawkesville; (2) retaining wall at New Hamburg; (3) extra steel joists on concrete floor for the 120 x 18 ft. bridge at New Hamburg. Plans with Engineers and S. Cassel, New Hamburg, J. G. Hurst, Connestogo, Ont.

New Lowell, Ont.
Station for G. T. Rly. Company's architect has prepared plans. Approved by Municipal Council.

Province of Quebec.
Bridge, cost $9,500, over Nation River, for Municipal Councils of Parish and Village of St. Andre Avellin. Secretary-treasurer Parish, E. G. Belisle. Secretary-treasurer Village, L. Bourjeois. Plans, etc., at office of sec.-treas. One

span, 105 x 17, concrete, steel and 4-in. red pine. Tenders called.

Rainy River, Ont.
Dredging for Dom. Govt. Dept. of Public Works. Tenders received by Secretary, R. C. Desrochers, Ottawa, until Aug. 12th, 4 p.m. Specifications, etc., at office of Secretary, Ottawa.

Sandwich, Ont.
Concrete dock, cost $7,000, River front, planned by Town Council. Mayor, Ed. Donnelly. Tenders received by Clerk, E. N. North, from August 5th to 15th. Old dock will be repaired, new concrete top and sides.

Trenton, Ont.
Canal. Tenders received by Secretary, Dom. Govt., Dept. Railways & Canals, L. K. Jones, Ottawa, Ont., until August 25th for Port Severn Section, Severn Division Trent Canal. Plans at office Chief Engineer, Dept., Ottawa. Engineer in charge, Welland Ship Canal, St. Catharines. Dist. Engineer Midland & Post Master, Orillia.

Toronto, Ont.
Harbor improvements. Tenders received by Sec., R. C. Desrochers, Ottawa, Dom. Govt. Dept. of Public Works, until Aug. 25th. Work includes sea wall, 17,295 ft. long, steel piles and timber; breakwater 18,600 ft. long; ship channel, 16,705 ft.; retaining wall 6,894 ft.; dredging 24 ft. deep. Plans at office of J. G. Sing, Toronto; H. J. Lamb, Windsor, J. U. Michaud, Montreal.

Winnipeg, Man.
City has applied to Minister of Public Works, Ottawa, for permission to replace a Howe truss span in its tramway bridge over the Winnipeg River, near Lac du Bonnet, Prov. of Man., by a steel span girder. Plans, specifications, etc., at Dept. of Public Works, Ottawa, and at the Land Titles Office, at Winnipeg, No. 313. Sec., M. Peterson. Engineer, H. N. Ruttan, 223 James Ave.

CONTRACTS AWARDED

Cape Tormentine, N.B.
Car ferry terminal, cost $571,590. Dom. Govt. Dept. of Railways and Canals. Sec., L. K. Jones, Ottawa. General contractor, Albert Mackie, Standard Bank Bldg., Toronto. Stone, Sackville Freestone Co., Sackville, N.B. About 110,000 tons stone required.

Carleton Point, P.E.I.
Car Ferry terminal, cost $950,000, Dom. Govt., Dept. of Railways & Canals. Sec., L. K. Jones, Ottawa. General contractors, Roger Miller & Sons, Lumsden Bldg., Toronto.

Middleton, N.S.
Two concrete culverts for C. P. R. (Dom. Atlantic Rly., Div. Kentville, N.S.). General contractors, Power & Brewer, St. John.

Ottawa, Ont.
Dredging planned by Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractor, F. A. Fowler, Little Branch, N.B., for dredging Little Black River.

Prov. of Quebec
Bridge, cost $4,450, over La Loutre River, for Municipal Council of Ste. Euphemie. Sec.-Treas., Donat Proulx. Engineer, L. A. Vallee, Que. General contractors, La Cie G. Blais. Ltd., Montmagny.

Bridge, cost $17,500, over Duchene River, for Municipal Council of St. Jean Deschaillons. Sec.-Treas., J. A. Jacques. Engineer, L. A. Vallee, Que. General contractors, Barabe & Jacques, Deschaillons.

Bridge, cost $4,975, over Deep River, for Municipal Council of Ste. Philomene. Sec.-Treas., L. U. Blanchet. Engineer, L. A. Vallee, Quebec, Que. General contractors, Barabe & Jacques, Deschaillons.

Bridge, cost $17,000, over Yamaska River, for Municipal Council of St. Pie. Sec.-Treas., G. D. Morin, M.P. Engineer, L. A. Vallée, Quebec, Que. General contractor, Jean Ducharme, St. Cesaire. One span, 200 x 17, concrete, steel and 4 in. red pine.

Bridge, cost $4,750, over Fourche du Pin River, for Municipal Council of Ste. Cajeton d'Armagh. Sec.-Treas., C. Boivin. Engineer, L. A. Vallee, Quebec, Que. General contractor, Elzoa Duchesneau, Ste. Cajeton d'Armagh.

Saskatoon, Sask.
Traffic bridge, cost $398,000, over Saskatchewan River, from University grounds, planned by City Council. Clerk, Andrew Leslie. Chairman Board of Highway Commissioners, A. J. McPherson. General contractors, R. J. Lecky & Co., Regina.

Public Buildings, Churches Schools, etc.

Brampton, Ont.
Clock tower. Tenders received by Sec., R. C. Desrochers, Ottawa, Dom. Govt. Dept. of Public Works, until Aug. 18th. Plans at Dept., also Post Office, Brampton. Clock tower for public building.

Charlottetown, P.E.I.
Sanitarium contemplated by Provincial Govt., Dept. of Public Works. Premier, J. A. Mathieson. Architect, Mr. Scopes. Site has been selected about 1½ miles from North Wiltshire Station. Building to start as soon as plans are completed. To accommodate 24 patients.

Frelighsburg, Que.
Academy planned for R. C. Denomination. Plans, etc., with Rev. O. Peloquin, who will receive tenders until Aug. 19th, for construction of academy.

Glace Bay, N.S.
General hospital. Tenders received by Chairman Building Committee, Norman McKenzie, up to August 12th. Plans and specifications at offices of J. T. Martell. Secretary and architect. Cement and brick construction.

Halifax, N.S.
College extension, cost $75,000, Windsor, for R. C. Corporation. Archbishop, Rev. E. McCarthy, Dresden Row. Architect, H. E. Gates, 88 Hollis street. Four storeys. Plans in progress.

Harwich Twp., Ont.
School, cost $4,000, planned for School Section No. 10. Further information from George Riseborough, Blenheim.

Melville, Sask.
School, cost $20,000, planned for Melville School Dist. Sec.-Treas., A. Burgman. Two storeys. Tenders will be called as soon as debentures are sold.

Moncton, N.B.
Church and school building, Dunn Bridge, for First Moncton Baptist Church. Sec. of trustees, W. H. Estano. Architect, C. B. Chappell, Charlottetown, P.E.I. Plans may be seen at office of W. C. Barnes, architect, Wyse Bldg., or at office of C. B. Chappell, architect, Charlottetown, P.E.I. Stone or brick construction. Tenders received bv Sec., till Aug. 12th.

Montreal, Que.
Theatre, St. Catherine, for W. F. Stair, Stair Bldg., Toronto, c/o Thos. J. Duggan, 210 St. James St., Montreal. Mr. Duggan is handling negotiations in Montreal.

School, cost $55,000, Longueuil (St. Charles) for R. C. School Commissioners. Architect, Alf. Prefontaine. New tenders to be called after Aug. 4th. Three stys., 60 x 80, cement foundation, reinforced concrete, Plastic and Laprai brick construction.

School, Notre Dame de Grace, for R. C. School Commissioners of Notre Dame de Grace. Architect, G. A. Monette, Toronto Bank Chambers, 260 St. James W. Concrete foundation, steel and brick construction. Plans in progress.

Children's school, cost $45,000, for Children's Memorial Hospital, c/o Dr. A. MacKenzie Forbes, Sec., Cedar Ave. Architects, Brown & Vallance, 12 Canada Life Bldg., are preparing plans.

School, cost $80,000, Maisonneuve, for R. C. School Commissioners. Architect, C. A. Reves, 58 St. James. General contractor, A. Choquette, 170 Bourbonniere, will receive tenders shortly for all trades. Contracts will be settled about Aug. 6th.

Moose Jaw, Sask.
Tenders called by Dom. Govt. Dept. of Trade and Commerce. Deputy Minister, F. C. T. O'Hara, Ottawa, for erection of terminal elevator at Moose Jaw. Plans, specifications, etc., at Dept., Ottawa, and at offices of Board of Grain Commissioners, Fort William, Ont.

North Vancouver, B.C.
Drill hall planned by Dom. Govt. Dept. of Militia and Defence. Sec., E. F. Jarvis, Ottawa. Plans, specifications, at offices of Dist. No. 11, Victoria, B.C.; City Clerk, N. Vancouver, and Director of Engineer Services, headquarters Ottawa. Tenders received by Director of Contracts Dept., Ottawa, till noon Aug. 11th.

Police station and court house, cost $30,000, will be erected on 2nd Street east of Lonsdale Ave. Clerk, Austin Brown. Sketch plans have been prepared.

Ottawa, Ont.
Tenders received by Sec., R. C. Desrochers, Ottawa, Dom. Govt. Dept. of Public Works, until Aug. 11th, for stone and iron fence for Rideau Hall. Plans, etc., at office of Secretary.

Church, cost $15,000 to $25,000, Sunnyside, planned for Presbyterian Church of Ottawa South, Ottawa. Architect, J. Albert Ewart, 193 Sparks St. Tenders will be called in a week or so. Concrete and stone foundation, stone facing, brick construction.

Fire hall, cost $100,000, Albert, contemplated. Mayor, J. A. Ellis. Architect not chosen.

Post office, West End. Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Architect, Works Department, preparing plans.

Church, cost $150,000, Second and Lyon, planned for Glebe Methodist Church, c/o A. S. Wickware, 7 Powell Ave. Architect, C. J. Burritt, 193 Sparks St. It is expected that tenders will be called within three weeks.

Club house, cost $23,000, Ottawa River, contemplated for Ottawa Canoe Association, per Sec., Sussex St. Plans will be prepared.

Quebec, Que.

Church for the Congregation of St. Mathew's, Rev. F. G. Scott, Simard St. Committee, Dr. Jas. Laurie, St. Foye, Que. M. A. J. Teakle, St. John Street, Architect, Ralph N. Gram, Boston, Mass. This church to be erected in rememberance of General Wolfe. Plans in progress.

Church, cost $45,000, planned for Rev. Fathers, Limoilou Fransciscoin. Architect, Jos. P. Ouellet, St. Famille St. Interior fittings, C. E. Morissette. Marble columns, plate glass, gold paint.

Catholic church, St. Joseph, for Parish of St. Roch, 158 St. Joseph. Architect, E. M. Talbot, 14 St. Joseph. Plans being prepared.

Roseisle, Man.

School, cost $4,000, planned. Sec.-Treas., W. D. B. Voyd. Architect, E. D. Tutle, 701 McArthur Bldg., Winnipeg. Tenders will be called about Aug. 12th. One storey and basement, concrete foundation, frame construction.

Regina, Sask.

City Stables, cost $15,000, Albert St. Architect, R. W. Allen, City Engineer's office, has plans prepared. Two stys., frame and stone construction, galvanized iron roofing.

Officers' Home, cost $10,000, contemplated for the Salvation Army. Interested, Ensign Weir, S. A. Citadel, Broad street, and Major McLean, Divisional officer, Winnipeg. Two storeys, brick foundation and construction, electric lighting.

Garage loading station, cost $10,000, planned by City Council. Architect, R. W. Allen, City Engineer's office. Clerk, A. W. Pool. Two storeys, concrete foundation, reinforced concrete and brick construction, galvanized iron roofing.

Saskatoon, Sask.

Tenders called by Dom. Govt. Dept. of Trade and Commerce. Deputy Minister, F. C. T. O'Hara, Ottawa. For erection of terminal elevator at Saskatoon. Plans, specifications, etc., at Dept., Ottawa, and at offices of Board of Grain Commissioners, Fort William, Ont.

Sunnidale Twp., Ont.

School planned for School Sec. No. 8. Architect, Jno. Wilson, Collingwood. Tenders received by Sec., P. S. Fleming, Stayner, Ont., until Aug. 11th.

Toronto, Ont.

Club addition, cost $6,500, planned for University Club, 82 King W. Architects, Sheppard & Colvin, 43 Scott St. 2½-stys., 24 x 40, brick and steel construction, brick foundation. Tenders called.

Market building, St. Patrick, for Board of Control. Mayor, H. C. Hocken. Tenders received until Aug. 12th. Plans, etc., at office of City Architect.

Vancouver, B.C.

Post office building, cost $100,000, Mt. Pleasant, planned by Dom. Govt. Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Architect, A. Campbel Hope, Empire Bldg., has been commissioned to prepare plans and wishes to receive samples and prices of Canadian made building materials. Building to be entirely fireproof.

Victoria, B.C.

Tenders received by A. Johnston, Deputy Minister of Marine and Fisheries, until August 25th for construction of a wooden fog alarm building at Discovery Island, Huro Strait, B.C. Plans, specifications, etc., at this Dept., Ottawa and Victoria, and Post Offices at New Westminster, Vancouver, Nanaimo and Alberni.

Walkerton, Ont.

Heating for library. Tenders received by Secretary, W. B. Thompson, until August 15th. Plans at office of Secretary and from architect, Geo. Gray, Harriston.

Winnipeg, Man.

Orphanage for Esther Robinson, Jewish Orphanage of Winnipeg. Sec.-Treas., R. S. Robinson, 171 James St. E. Will apply to Govt. for charter. It is proposed to erect buildings on the cottage plan.

Church, cost $50,000, Cathedral Ave., for St. Johns Presbyterian Church. Pastor, Rev. J. P. Jones, Bannerman Ave. Architect, R. L. Smith, 417 Somerset Bldg. Plans, specifications, etc., office of Architect, who received tenders till July 31st for excavating and drains. Tenders for other trades will be called later.

Wolfville, N.S.

Library and museum, cost $30,000, planned for Acadia University. President, Dr. Geo. B. Cullen. Architect, A. R. Cobb, Halifax, N.S. Free stone construction.

Yarmouth, N.S.

Drill hall, for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Town Council have purchased site. Building will be started next spring. Supervisor, Col. Mowbray, of Halifax. 60 x 100, stone construction.

CONTRACTS AWARDED

Berlin, Ont.

Fire hall, cost $18,000, Edward Street. Mayor, W. R. Kuler. Architect, C. Knechtel. General contractor, J. Baetz, Mill St. Excavating done.

Municipal barns, cost $6,000, Wilmot St., planned. Mayor, W. R. Kuler. Architect, C. Cowan. Carpenter, H. Dunker, 46 Shanley Street.

Edmonton, Alta.

School, cost $160,000, Hudson Bay Reserve. Secretary, Mr. Brady. Architect, G. E. Turner, Mortlake Block. General contractors, Brown & Hargreaves. Two storeys, 108 x 210, concrete foundation, brick construction.

Hampton, N.B.

Post office. Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Architect, H. H. Mott, 13 Germain St., St. John, N.B. General contractors, British American Construction Co., Ltd., c/o manager, P. I. Ligan, Prince William St., St. John. Reinforced concrete, Trussed Concrete Steel Co., Halifax, N.S. Manager, Harvey Thorn.

Lachine, Que.

Public building, cost $20,200. Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractor, Adolphe Gauthier, Lachine.

McNab, Ont.

Parish hall, cost $3,500, for Trustees of St. Johns Church. Architect, A. E. Nicholson, 46 Queen St., St. Catharines. General contractor, M. Mullen. One storey, 27 x 45, concrete foundation, brick construction. Foundations in.

Melville, Sask.

Church, cost $8,000, for German Evangelical Association. Architect, E. R. Munole. General contractor, A. B. Cunningham. One storey, 60 x 85. Foundations in.

Moving picture theatre, cost $8,000, for Besler Bros. Architects, E. R. Mund & Co. General contractor, A. L. Zeigler. One storey. Excavating started.

Magog, Que.

Bank building, Main street, for Canadian Bank of Commerce, head office, Toronto. Builder, G. N. Thompson, Magog. Iron and steel, MacKinnon, Holmes & Co., Sherbrooke. Other work being done by day labor under supervision of builder. Foundations in.

Montreal, Que.

Moving Picture Theatre, cost $15,000, St. Catherine and Bleury, for Peerless Amusement Co., St. Catherine and Bleury. Architects and general contractors, White Construction & Realty Co., Coronation Bldg. 38 ft. high, concrete and brick foundation, concrete block construction.

Repairs to school, cost $10,000, 120 Fullum, for R. C. School Commissioners, c/o U. Lafontaine Com. Academy, 85 St. Catherine W. Architect, L. R. Montbriand, 20 St. Andre. General contractor, H. Demers, 47 Labelle.

Grenadier guard armoury, Esplanade, for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Architects, MacVicar & Heriot, 104 Union Ave. General contractors, carpenters, concrete, plastering and painting, D. G. Loomis & Sons, St. Patrick. Steel and metal lockers and electric not let. Roofing, Campbell, Gilday Co., Ltd., 563 St. Paul St. Heating and plumbing, Hickey & Aubut, 93 Dominion St. Two storeys, 169 x 126.

Addition to school, cost $25,000, Laval Ave. Commissioner Scolaire, St. Jean Baptiste. Architect, J. A. Godin, 269 St. Denis St. General contractor, P. J. Charlebois, 1234 St. Hubert. Brick, Brunet & Nadeau, 1347 Van Horne. Heating and plumbing, J. & C. Brunet & Co., 223 St. Lawrence. General contractor does of work.

Signal house, cost $5,750, Argyle Ave., for Canadian Pacific Rly. Builders, D. G. Loomis & Sons, St. Patrick St. Three storeys, 30 x 18, brick construction. Foundations started.

Post office fittings, St. Lambert. Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractors, The J. T. Schell Co., Alexandria, Ont.

Children's hospital, cost $35,000, for Children's Memorial, c/o of Dr. A. MacKenzie Forbes, Sec., Cedar Ave. Architects, Brown & Vallance, 12 Canada Life Bldg. General contractor, W. V. Brennan, 6 Lincoln Ave., Verdun. Tenders for other trades received shortly by Architect. Three storeys, 40 x 50, concrete and stone foundation, brick construction. Excavating started.

School, cost $196,000, Longue Pointe (Lavaltre). R. C. School Commissioners, c/o U. Lafontaine, 85 St. Catherine W. Architect, Z. Trudel, 238 St. Andre. General contractor, carpenter and painting, H. Demers, 47 Labelle. Mason, O. Corbeil, 1173 City Hall Ave. Brick, Jos. Monette, 12 St. Louis Sq. Plastering, F. X. Charbonneau, 668 Sherbrooke E.

Postal station "H," cost $200,000, Bishop and St. Catherine W. Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Architects, Cox & Amos, 78 Crescent St. General contractor, C. E. Deakie, New Sommer Bldg. Granite, Argenteuil Granite Co., 42 Craig W.

School addition, cost $17,000, Drolet, for School Commissioners of St. Jean Baptist Ward. Architect, J. A. Godin, 269 St. Denis St. General contractor, P. J. Charlebois, 1234 St. Hubert. Brick, Brunet & Nadeau, 1347 Van Horne. Carpenter, steel, roofing, plastering and painting, General contractor. Heating, plumbing, J. & C. Brunet & Co., 223 St. Lawrence.

St. Cyprians church, cost $10,000, Maisonneuve, c/o Mr. Mount, 4278 St. Catherine W. or Rev. Wm. Robinson, 430 Pio IX. Architects and general contractors, Westmount Plumbing & Heating Co., 4278 St. Catherine W. Basement to be built at once and roofed over, church to be built about a year later. 14 ft. basement, 47 x 104, cement and brick foundation. Excavating started.

North Battleford, Sask.

Drill hall, cost $28,500. Dom. Govt. Dept. of Militia and Defence. Sec., E. F. Jarvis, Ottawa. General contractors, Piggott & Healey, Picton, Ont.

Orono, Ont.

Armoury, cost $12,000, for Dom. Govt. Dept. of Militia & Defence. General contractor, W. A. Thom. Work to start at once. To be completed March 1st, 1914.

Port Arthur, Ont.

Armouries, cost $200,000, Park and Secord, for Dom. Govt., Ottawa. General contractors, Canadian Stewart Co., Port Arthur. Foundations in.

Quebec, Que.

Transportation building, cost $25,000, for Exhibition Com., City Hall. Architect, A. Pinsonnault, City Hall. General contractors, mason and carpenter, Mr. Magloire Cauchon, 307 Richardson. Iron and Steel, Eastern Canadian Steel & Iron Co., St. Malo. Roofing, A. Falardeau. Painting, J. M. Tardivel. Structural steel and brick construction.

Church, cost $13,000, for French Presbyterian Congregation. Architect, T. R. Peacock, 76 de Salaberry. General contractors, L. H. Peters Co., 10 St. Angele. Brick, Citadel Brick & Paving Block Co., Auditorium Bldg. To be completed about February, 1914. Devonshire brick construction, stone trimmings.

Interior fittings, postal station "B." Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractors, The J. T. Schell Co., Alexandria, Ont.

Poultry building, cost $3,000, for Exhibition Board. Architect, J. L. Pinsonneault, City Hall. General contractor and carpenter, Ed. Paquet, 18 Couillard. Roofing, Nap Durand, 445 St. Francois St. One storey, 100 x 50, galvanized iron roofing.

Regina, Sask.

Assembly hall, cost $20,000, Broad, for Salvation Army. General contractor, A. W. Bain. Two storeys, concrete foundation, stone and brick construction.

Jewish synagogue, cost $45,000, Ottawa St. President, S. Pearlman, 10th Ave. and Broad St. General contractors, Mellville & Dowell. 30 x 50, brick foundation, stone construction.

Simcoe, Ont.

Armoury, cost $30,000. Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractor, Robert E. Gunton, Simcoe.

St. Felicien, Que.

Church, cost $123,000, Lake St. John, for R. C. Church Congregation. Architect, Jos. P. Ouellet, 28 Ste. Famille St. General contractor, Edmond Tremblay, St. Anne de Chicoutimi, Que. 212 x 75, embossed stone construction.

St. John, N.B.

Club house, Wellington Row, for Elks Club, c/o H. J. Fleming, 130 Pond Street. Architect, F. Neil Brodie, 42 Princess. Steel, Fleming & Sons, 130 Pond street. Painting, Jas. Pullen, 16 Horsefield St.

Toronto, Ont.

School, Lansdowne School, for Board of Education. Sec., W. C. Wilkinson. Electric wiring, Fred Armstrong & Co., Queen W., $1,210.

Westboro, Ont.

Church, cost $11,000, for Presbyterian Congregation. Pastor, Rev. W. H. Craim. Architect, J. P. MacLaren, 104 Sparks St., Ottawa. Carpenters, Low & Raitt, 148 Percy St., Ottawa. Heating and plumbing not yet let.

Waterloo, Que.

Bank building for Canadian Bank of Commerce, head office, Toronto. Builder, G. N. Thompson, Waterloo. Work being done by day labor under supervision of builder. Excavating started.

Winnipeg, Man.

Church, cost $10,000, Westminster and Furby streets, for the Unitarians. Architect, John D. Atcheson, Trusts & Loan Bldg. General contractors, Grey & Davidson, Portage and Arlington street. Architect is receiving tenders for roofing, heating, plumbing and electrical work.

School, St. Vital, for Rural Municipality of St. Vital. Sec.-Treas., John Edmond, Grand Vital. Architects, Hooper & Davis, Confederation Life Bldg., Winnipeg. General contractors, Modern Construction Co., Sterling Bank Bldg, Winnipeg. Two storeys, 40 x 60.

Business Buildings and Industial Plants

Chicoutimi, Que.

Store and residence, cost $3,000, Bogin, for Treffle Harvey. 40 x 35, stone foundation, iron and steel roofing. Plans drawn.

Jasper Park, B.C.

Hotel contemplated for G. T. P. Rly. Hotel manager, F. W. Bergman, Ottawa, Ont. Plans to be prepared shortly.

Montreal, Que.

Automobile factory, Laurier and De Gaspe, for The Ford Automobile Co. of Canada, Walkerville, Ont. Four stys., 31,315 sq. ft., concrete foundation, steel frame and brick construction. As much glass to be used as possible. Plans in progress.

Stores and flats, cost $50,000, for Thos. Coggins, 319 St. Antoine St. Architect, C. A. Mitchell, 58 Beaver Hall Hill. Tenders received by Architect. Three stys. and basement, 80 x 100, pressed brick construction, concrete foundation.

Mount Robson, B.C.

Hotel for G. T. P. Rly. Hotel manager, F. W. Bergman, Ottawa, Ont. Plans to be prepared shortly.

Niagara Falls, Ont.

Store and flats, cost $4,000, Queen, for Roland Reed, Queen St. Two storeys, 21 x 50, cement foundation, brick construction. Plans in progress.

Ottawa, Ont.

Warehouse, cost $30,000, Bohelier, for H. L. Florence, Sussex St. Architect, A. L. Weeks, Sparks St. Two storeys, concrete foundation, solid brick construction. Plans in progress.

Factory, Bannermour, for Dusbane Mfg. Co., Sussex St. Site has been purchased and plans are in progress. Two storeys, 120 x 60, concrete foundation, solid brick construction.

Stores, etc., cost $6,000, Besserer, for H. J. Borbridge, 88 Rideau St. Concrete and stone foundation, solid brick construction. Plans in progress.

Prince Rupert, B.C.

Hotel, contemplated for G. T. P. Rly. Hotel manager, F. W. Bergman, Ottawa, Ont. Plans to be prepared shortly.

St. George, N.B.

Bank building, contemplated by Bank of Nova Scotia. Supervisor, Chas. Easson, St. John, N.B. Plans will be prepared.

Shawinigan Falls, Que.

Extension to paper mill, for The Belgo-Canadian Pulp & Paper Co., Ltd. Engineer, Owners. Plans and specifications being prepared by Owners for building and machinery. Machinery contracts will not likely be let until end of 1913 as sulphite mill will not be in operation before Aug., 1914, and extension to paper mill about Dec., 1914.

Welland, Ont.

Factory, planned for The Electric Steel & Metals Co., Ltd., Welland. Ratepayers voted on by-law for fixed assessment.

Winnipeg, Man.

Paper mill for The Austin Paper Mfg. Co., Ltd. President, R. D. Waugh, 28 Stradbrooke Place. Company capitalized at $150,000. Will erect plant to manufacture paper from flax straw.

CONTRACTS AWARDED

Amherst, N.S.

Drug store, cost $5,000, Victoria, for Douglas Bros. Architect, J. L. Allan. General contractor, J. N. Fage. Three storeys, 50 x 30.

Factory, cost $35,000, Foundry, for Amherst Pianos Ltd. Architect, J. N. Fage. Painting, W. A. Allan. Three storeys, 60 x 50.

Berlin, Ont.

Shoe factory, Michael St., for C. A. Ahrens. Architect, C. Cowan, 200 Victoria St. Mason, J. Baetz, Mill St. Carpenter, H. Dunker, 46 Shanley St. Two storeys, 45 x 70. Foundations in.

Collingwood, Ont.

Warehouse and grain elevator, for T. Long & Bros., Ltd., Hurontario St. Architect, Jno. Wilson, Hurontario St. Concrete work, Jno. Lackton. Brick work, A. Courts. Carpenter, N. A. Campbell. Plumbing, McFadgen & McQuade. Painting, A. Pomphrey. Electric work, refrigerator machinery, cork-board insulators for cold storage, not yet awarded.

Edmonton, Alta.

Garage, cost $18,000, Government House site. Dom. Govt. Dept. of Public Works. Work done by day labor. Two-storeys, 35 x 72, cement foundation, brick construction. Foundations started.

Fort William, Ont.

Business block, cost $7,000, S. May St., for F. S. Jones, S. May St. Architects and builders, Russell Bros. Two storeys, 25 x 60, brick construction, cement foundation.

Montreal, Que.

Stove foundry, etc., St. Laurent, for Canada Stove & Furniture Co., Ltd., St. Catherine and Delorimier Sts., Montreal. Architect, W. A. Mahoney, Guelph, Ont. General contractors, The James Shearer Co., Ltd., 225 St. Patrick. General contractors will call tenders later for roofing, painting and glazing.

Two stores and flats, cost $15,000, Outremont (Durocher and Lajoie). Mr. Jos. Lebeau, 100 Parc Lafontaine. Architect, Z. Trudel, 238 St. Andre. General contractor, plastering and carpenter, A. Frenette, 212 Fabre St. Steel, Dom. Bridge Co., Lachine. Roofing, heating, plumbing and electrical, Jos. Belisle & Frere, 808 Papineau. Foundations in.

Offices, etc., cost $450,000, for Imperial Wire & Cable Co., 241 Guy St. Architect, W. J. Carmichael, Bell Telephone Bldg. General contractor, E. G. M. Cape, New Birks Bldg. Steel, Dom. Bridge Co., Lachine.

Alterations to newspaper office, cost $8,000, 75 St. James St., for Le Canada, 75 St. James St. General contractor, H. Demers, 47 Labelle. General contractor doing all work.

Two stores and residence, cost $15,000, Westmount (366 Victoria Ave.). Architect and builder, D. J. Finlayson, 366 Victoria Ave. Mason, J. W. Wilson, 40 Lincoln. Carpenter, A. A. Sharp, 27 Hillside. Owner does all other work. Two storeys and basement, 40 x 55, cement foundation, brick construction.

Restaurant, cost $43,500, Peel St., for Childs Co., 200 5th Ave., New York. Architect, J. C. Westervelt, 110 West 34th St., New York, N.Y. Supervisoring architect, D. J. Spence, 46 Beaver Hall Hill, Montreal. General contractors, mason and carpenter, Owners, c/o Mr. Swanson, 142 Peel St. Tile, Alex. Reed Co., New York, N.Y. Architectural iron, Can. Arch. Iron Works, 74 St. Dominique. Roofing and ventilating, Geo. W. Reed & Co., 37 St. Antoine. Plastering, Geo. Knott & Co., Chestnut Ave. Gas, heating and plumbing, Westmount Plumbing & Heating Co., 4278, St. Catherine W. Electric, Coolyer & Brock, 131 St. Alexander. Interior fittings, W. D. Lewis Co., New York, N.Y. Marble and painting not let. Three storeys, 42 x 114, steel construction.

Ottawa, Ont.

Storehouse, cost $15,000, Cooper, for Ottawa Dairy Co., Somerset St. Architect, J. Albert Ewart, 193 Sparks St., Ottawa. General contractor, F. McCullough, 181 Waller. Carpenter, J. Wallace, c/o General Contractor.

Business block, cost $100,000, Albert, for Mrs. Cowie, Albert St. Architect, C. P. Meredith, 126 Sparks St. Mason, T. C. James, 140 Flora. Carpenter, Alex. Christie, Elgin St. Painting, W. J. Carson, 293 Laurier Ave. Electrical, H. B. Parks, 205 Laurier Ave. Plastering, plumbing and heating not let yet. Steel Dom. Bridge Co., Sparks St.

Port Arthur, Ont.

Laundry, cost $21,000, Van Norman, for Armstead & Co. Architect, Carl Wirth, Fort William. General contractor, R. Smith, Prince Arthur Hotel. Two storeys, 50 x 165.

Addition to store, cost $25,000, Cumberland, for I. L. Matthews & Co. Architect, Fred Urry, 237 Arthur St. General contractors, Cox & Jones. One storey addition, 65 x 110, red clay brick construction.

Garage, cost $20,000, for Central Garage Co., 234 Park St. General contractor and mason, Geo. H. Otto, 206 Arthur St. Two storeys, 50 x 100, cement foundation, red clay brick construction.

Regina, Sask.

Office building, cost $10,000, 6th Ave. Owner and general contractor, W. H. Joyce. Two storeys, brick construction. Foundations in.

St. Catharines, Ont.

Flax mill, cost $150,000, Lincoln Ave., for Canadian Flax Mills, Ltd., 24 King W. Supt.-in-charge, Austin Campbell, Welland House, St. Catharines. Mason, Newman Bros., St. Paul St. Heating and plumbing, A. Riddell & Son, St. Paul St. Two storeys, 100 x 60, brick construction, felt and gravel roofing, machinery required.

St. Thomas, Ont.

Brass factory, cost $25,000, Wellington, for St. Thomas Brass Co., M. C. R. Yds. Manager, J. B. Potts. General contractor, Albert E. Ponsford, 605 Talbot St. Fenestra Steel Sash, Steel & Radiation, Ltd., Fraser Ave., Toronto.

Tillsonburg, Ont.

Pickle factory, cost $5,000, for Heinz Pickle Co. Builder, Owner. Frame construction.

Toronto, Ont.

Bank building, Queen and Brock Ave., for Standard Bank, Toronto. Architect and builders, Baldwin & Woods, 9 Front E. Concrete, foundation, stone and brick construction.

Boiler house, cost $5,000, Dufferin. Owners and general contractors, A. B. Ormsby & Co., Queen and George. Engineer, Company's Engineer. Two stys., 24 x 40, brick foundation and construction. Excavating started.

Vancouver, B.C.

Factory, 11th Ave., for The Alaska Feather & Down Co., 412 St. Ambroise. President, J. H. Parkhill. General contractor, Fred Sherborne, Metropolitan Bldg. Four storeys, brick and mill construction.

Warehouse, csot $70,000, Homer and Davis Sts. Owner and general contractor, Geo. R. Baker, 835 10th Ave. W. Architects, Sharpe & Thompson, 536 Hastings St. W. Three storeys and basement, 119 x 200. Excavating started.

Wadena, Sask.

Hotel, cost $26,000, for Ike Diner, Yorkton. Architect, Max Blankstein, 450 Dufferin Ave., Winnipeg. General contractors, Alex. Black Lumber Co. Three storeys, 46 x 72.

Winnipeg, Man.

Warehouse, cost $19,000, Winnipeg Ave., for Metallic Roofing Co., Notre Dame Ave. Architects, Jordan & Over, 47 Canada Life Bldg. General contractor, Worswick Bros., Poplar Ave. Two storeys, 58 x 100, brick construction.

Yorkton, Sask.

Office building, for The Dom. Express Co., Ltd. General contractor, C. J. McLeod. Two storeys, brick foundation and construction.

Residences

London, Ont.

Residence, cost $10,000, Richmond St., planned for Geo. H. Belton, cor. Central Ave. and Wellington. 40 x 40, cement foundation, white brick construction. Owner will receive tenders until August 7th.

Sandwich, Ont.

Residence, cost $5,000, for Rev. D. Hind. Tenders received by Architects, G. Jacques & Co., Windsor, from August 5th to 15th. Two storeys, 30 x 30, brick foundation, brick veneer construction.

Toronto, Ont.

Three residences, cost $6,000, for H. Fine, 12 Milan St. Architect, R. A. Abraham, 23 Jordan St. Two storeys, 48 x 44, brick foundation and construction. Owner now open for tenders.

One detached residence, cost $16,000, Warren Road, for J. E. Atkinson, Toronto Daily Star. Architects, Langley & Howland, Confed. Life Bldg. 2½-stys., 46 x 80, stone foundation, stone, reinforced concrete, brick and structural steel construction, slate, galvanized iron. Tenders in. Contracts not yet awarded.

Windsor, Ont.

Bachelor apartments, cost $16,000, Ferry, for F. K. Dresch & Son, 17 Ferry St. Architects, Leybourne & Whitney, Windsor. Three storeys and basement, 34 x 50, brick foundation, brick and structural steel construction. Tenders received by Architect from August 1st until August 15th.

Bungalow, cost $6,000, Ouelette, for Jno. Pageau. Tenders received by Architects, G. Jacques & Co., from August 4th to 15th. 1½ storeys, 30 x 32, brick foundation, stucco and brick veneer construction.

Winnipeg, Man.

Residence, cost $6,000, Elm, for A. Macaw, 803 Trust & Loan Bldg. Architect, c/o Owner. Two storeys, 24 x 32, stone foundation, frame and stucco construction. Plans ready.

Four residences, cost $6,000, Anderson Ave., for Cohen & Meyerwitz, 685 Alfred Ave. Architect, c/o Owner. 1½ stys., 20 x 36, stone foundation, frame construction.

Residence, cost $6,400, Rosedale Ave., for Canadian Syndicate Investments, Somerset Bldg. Architect, c/o Owner. Two storeys, 20 x 26, stone foundation, frame construction.

Residence, cost $5,000, Balfour Ave., for R. C. Mitchell, 312 Florence. Two stys., 26 x 28, cement foundation, frame construction. Plans ready.

CONTRACTS AWARDED

Hamilton, Ont.

Residence, cost $25,000, Queen St., for J. W. Lamoreaux, 26 Canada St. Gen-

(Continued on page 70)

Tenders and For Sale Department

Tenders Wanted

Sealed tenders will be received by the undersigned up to the **15th day of August, 1913,** for the heating of the Walkerton Public Library. Plans and specifications may be seen at the office of the secretary, Walkerton, or at the office of Mr. Geo. Gray, architect, Harriston. The lowest or any tender not necessarily accepted.
W. B. Thompson, Secretary. 32-33

CITY OF MONTREAL

Notice to Contractors

Contract No. 2

Tenders for the Construction of a System of Underground Conduits, ManholesTransformer Chambers, etc.

Sealed tenders in an envelope provided for the purpose, and addressed to the undersigned secretary of the Board of City Commissioners, will be received at the offices of the said Commissioners, City Hall, Montreal, in the Province of Quebec, until twelve o'clock noon, on the 15th day of August, **1912**, for the construction of a system of Underground Conduits, Main and Service Manholes, Transformer Chambers, etc., in, upon, and adjoining that portion of St. Catherine Street, between Atwater Ave. and Guy St., in the City of Montreal.

Tenders will be considered for the whole and not for a part only of the above mentioned works. and persons tendering are notified that tenders will not be considered unless made on the printed forms supplied by the Commissioners.

Plans, specifications and forms of tender may be obtained at the office of the Electrical Commission, 1009 New Birks Bldg, any day during office hours, upon payment of a deposit of One Hundred Dollars, which amount will be refunded after the receipt of a bona fide tender and the return of the said plans, specifications and other documents.

Each tender must be signed and sealed by all the parties to the tender, and duly witnessed, and be accompanied by an accepted cheque on a Chartered Bank of the Dominion of Canada, payable at Montreal to the City Treasurer, for a sum of Five Thousand Dollars ($5,000) to be increased (if required) before the contract is signed by the accepted tenderer to an amount equal to ten per cent. (10 p.c.) of the amount of his tender.

The person or firm whose tender is accepted shall, within ten days after the final acceptance thereof, sign the contract, specifications, and other documents required to be signed, and in case of the refusal or failure on the part of the person or firm whose tender is accepted, to complete and execute the contract with the City Commissioners, the said cheque shall be forfeited to the City Commissioners as liquidated damages for such refusal or failure, and all contract rights acquired by the acceptance of the tender shall be forfeited.

The cheque deposited by the person or firm whose tender is accepted will be deposited to the credit of the City of Montreal as security for the due and faithful performance of the contract according to its terms.

The cheque deposited by the person or firm whose tender is rejected will be returned within ten days after the signing of the contract.

The lowest or any tender will not necessarily be accepted.

By order,

L. A. HERDT, Chairman,
The Electrical Commission of the City of Montreal.

L. N. SENECAL, Secretary.
Board of City Commissioners.

Newspapers inserting this advertisement without authority will not be paid for it. 32

Sealed tenders addressed to the undersigned, and endorsed "Tender for Clock Tower, Public Building, Brampton, Ontario," will be received at this office until **4** p.m., on **Monday, August 18, 1913**, for the construction of a Clock Tower to the Public Building at the place mentioned.

Plans, specification and form of contract can be seen and forms of tender obtained at the Post Office, Brampton, Ontario, and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, July 28, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department. 44785. 32-33

Department of Railways and Canals, Canada

Welland Ship Canal

Notice to Contractors

Sealed tenders, addressed to the undersigned and marked "Tender for Track Ties," will be received at this office until 3 o'clock p.m., on **August 14th, 1913**, for the furnishing of **41,000** ties.

Specifications and forms of tender can be obtained from the Purchasing Agent, Department of Railways and Canals, Ottawa.

An accepted bank cheque for the sum of $500 made payable to the order of the Minister of Railways and Canals must accompany each tender. which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,
Asst. Deputy Minister and Secretary.
Department of Railways and Canals,
Ottawa, 2nd August, 1913.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.—45891. 32

Notice to Contractors

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on **Tuesday, August 19, 1913,** for the construction of the following sewer works:

Midway Sewer System

Outlet via Hiawatha Ave., Gerrard St. and Morley Avenue

Division No. 2, West Toronto

Woodville Avenue

Balsam Avenue, Queen Street to Kingston Rd.

East Toronto, Section A, Outlet

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications may be seen and forms of tender obtained at the office of the Commissioner of Works, Toronto. Tenderers shall submit with their tender the names of two sureties, approved of by the City Treasurer, or, in lieu of said sureties, the Bond of a Guarantee Company approved of as aforesaid. Conditions relating to tendering as prescribed by City By-law must be strictly complied with.

The lowest or any tender not necessarily accepted.

H. C. HOCKEN, Mayor,
Chairman Board of Control
Toronto, July 26, 1913. 32

Sealed tenders, addressed to the undersigned, and endorsed "Tender for East Pier, Eastern Entrance, Toronto Harbor, Ont.," will be received at this office until **4** p.m. on **Tuesday, Sept. 2, 1913**, for the reconstruction of part of superstructure of East Pier of Eastern Entrance to Toronto Harbor, in the County of York and Province of Ontario.

Plans, specification and form of contract can be seen and forms of tender obtained at this Department and at the offices of J. G. Sing, Esq., District Engineer, Confederation Life, Building, Toronto, Ont., and H. J. Lamb, Esq., District Engineer, Windsor, Ont.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent (10 p.c. of the amount of the tender, which will be forfeited if the person tendering declines to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, August 1, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.- 43525. 32-33

THE PAS, MANITOBA

Notice to Contractors

Sealed tenders, registered and endorsed on the envelope, "Tender for (tender bidding on)" and addressed to H. H. Elliott, M.D., Sec.-Treas. of the Town of The Pas, Man., will be received up to 6 p.m., **August 20th, 1913**, for the construction of the following works:

Tender A—Construction of Sedimentation Basin.

Tender B—Foundations for Power House.

Gravel 75c f.o.b. The Pas, Man.

Marked cheque for five per cent. (5 p.c.) of the amount of the bid must accompany each tender, or in lieu of the said cheque, the tenderer may furnish the bond of an approved surety company.

Plans, specifications and instructions may be seen at the offices of the Consulting Engineers, Saskatoon, or at the Resident Engineer's office at The Pas, Man., or plans and specifications will be given or forwarded on a deposit of Twenty ($20) Dollars—the deposit cheque to be returned if the plans and specifications are returned with the tender.

H. H. ELLIOTT, M.D., Sec.-Treas.,
The Pas, Man.
MURPHY & UNDERWOOD,
Consulting Engineers,
32-33 Ross Bldg., Saskatoon, Sask.

Department of Railways and Canals, Canada

Trent Canal

Port Severn Section—Severn Division

Notice to Contractors

Sealed tenders, addressed to the undersigned and marked "Tender for Port Severn Section—Severn Division, Trent Canal," will be received at this office until 2 o'clock p.m., on **Monday, August 25th, 1913.**

Plans, specifications and form of contract to be entered into can be seen on or after July 26th at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, at the office of the Superintending Engineer, Trent Canal, Peterborough, Ont.; at the office of the District Engineer, Public Works Department, Midland, Ont., and at the office of the Postmaster, Orillia, Ont.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labour, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque on a chartered bank of Canada, for the sum of $10,000 made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES,
Asst. Deputy Minister and Secretary.
Department of Railways and Canals,
Ottawa, 29th July, 1913.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.—45677. 32-33

Tenders for Dredging

Sealed tenders, addressed to the undersigned, and endorsed "Tender for Dredging, Little Current," will be received until 4.00 p.m., on **Tuesday, August 12 ,1913**, for dredging required at Little Current, Ontario.

Tenders will not be considered unless made on the forms supplied, and signed with the actual signatures of the tenderers.

Combined specification and form of tender can be obtained on application to the Secretary, Department of Public Works, Ottawa. Tenders must include the towing of the plant to and from the work. Dredges and tugs not owned and registered in Canada shall not be employed in the performance of the work contracted for. Contractors must be ready to begin work within thirty days after the date they have been notified of the acceptance of their tender.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, for five per cent. (5 per cent.) of the contract price, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, July 26, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—45519. 31-32

Tenders for Dredging

Sealed tenders, addressed to the undersigned, and endorsed "Tender for Dredging, Magnetawan River," will be received until 4 p.m., Wednesday, 20th August, 1913, for dredging required at Burks Falls, Ont.

Tenders will not be considered unless made on the forms supplied, and signed with the actual signatures of tenderers.

Combined specification and form of tender can be obtained on application to the Secretary, Department of Public Works, Ottawa. Tenders must include the towing of the plant to and from the work. Dredges and tugs not owned and registered in Canada shall not be employed in the performance of the work contracted for. Contractors must be ready to begin work within thirty days after the date they have been notified of the acceptance of their tender.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, for five per cent. (5 p.c.) of the contract price, (no cheque to be for less than fifteen hundred dollars), which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, August 1st, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—45752. 32-33

Tenders Wanted

Sealed tenders will be received up to noon on the **16th day of September, 1913**, by the undersigned at Cayuga, Ontario, for the construction of twenty-six and one-half miles of stone macadam road in the County of Haldimand.

The work will be let in three separate and distinct contracts, not necessarily to the same individual.

Tenderers are required to examine the localities of the work and are required to be present at the opening of the tenders at 2 p.m. on Wednesday, the 17th day of September, 1913.

Plans and specifications may be seen at the office of the County Engineers, Messrs. Jackson & Kyd, Dunnville, or may be had from them on the payment of $10, which sum will be refunded on return of the documents.

Lowest or any tender not necessarily accepted.

T. A. SNIDER, K.C., County Clerk,
County of Haldimand,
32-37 Cayuga, Ont.

CITY OF MONTREAL

Notice to Contractors

Contract No. 3

Tenders for the Construction of a System of Underground Conduits, Manholes, Transformer Chambers, etc.

Sealed tenders in an envelope provided for the purpose and addressed to the undersigned Secretary of the Board of City Commissioners will be received at the offices of the said Commissioners, City Hall, Montreal, in the Province of Quebec, until 12 o'clock noon, on the 15th day of August, 1913, for the construction of a system of Underground conduits, Main and Service Manholes, Transformer Chambers, etc., in, upon, and adjoining that portion of Bleury street and Park avenue between Craig street and Pine ave., in the City of Montreal.

Tenders will be considered for the whole and not for a part only of the above mentioned work, and persons tendering are notified that tenders will not be considered unless made on the printed forms supplied by the Commissioners.

Plans, specifications, and forms of tender may be obtained at the offices of the Electrical Commission, 1009 New Birks Bldg., any day during office hours, upon payment of a deposit of Five Hundred Dollars, which amount will be refunded after the receipt of a bona fide tender and the return of the said plans, specifications and other documents.

Each tender must be signed and sealed by all the parties to the tender, and duly witnessed, and be accompanied by an accepted cheque on a chartered bank of the Dominion of Canada, payable at Montreal to the City Treasurer, for the sum of Ten Thousand Dollars ($10,000) to be increased (if required) before the contract is signed by the accepted tenderer to an amount equal to ten per cent. (10 p.c.) of the amount of this tender.

The person or firm whose tender is accepted shall, within ten days after the final acceptance thereof, sign the contract, specifications, and other documents required to be signed and in case of the refusal or failure on the part of the person or firm whose tender is accepted, to complete and execute the contract with the City Commissioners, the said cheque shall be forfeited to the City Commissioners as liquidated damages for such refusal or failure, and all contract rights acquired by the acceptance of the tender shall be forfeited.

The cheque deposited by the person or firm whose tender is accepted, will be deposited to the credit of the City of Montreal as security for the due and faithful performance of the contract according to its terms.

The cheque deposited by the person or firm whose tender is rejected will be returned within ten days after the signing of the contract.

The lowest or any tender will not necessarily be accepted.

By order, L. A. HERDT, Chairman,
The Electrical Commission of the City of Montreal.
L. N. SENECAL, Secretary,
Board of City Commissioners.

Newspapers inserting this advertisement without authority will not be paid for it. 32

Tenders for a New Market

St. Patrick Square

Bulk tenders only will be received by registered post only, addressed to the undersigned up to noon on **Tuesday, 12th August, 1913**, for the above building.

Plans and specifications may be seen and forms of tender and all information obtained at the office of the City Architect, City Hall, Toronto. Envelopes containing tenders must be plainly marked on the outside as to contents. The usual conditions relating to tendering, as prescribed by City By-laws, must be strictly complied with or tenders may not be entertained. Tenderers shall submit with their tender the names of two personal sureties or the bond of a Guarantee Company, approved by the City Treasurer.

The lowest or any tender not necessarily accepted.

H. C. HOCKEN, Mayor,
Chairman of the Board of Control.
City Hall, Toronto,
July 30th, 1913. 32

Special Notice

Every man who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works are advertised.

Send along your plans when asking for tenders put a line in your advertisement to that effect.

No extra charge is made for filing plans at one or all four offices.

Contract Record and Engineering Review

Montreal—119 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—429 Pender Street.

DERRICKS FOR SALE

One 25-ton Terry & Tench travelling stiff leg derrick.

One 20-ton stiff leg derrick.

One 15-ton stiff leg derrick.

No reasonable offer refused.

National Sand & Material Company, Ltd.
30-31-32 Welland, Ont.

For Sale

One Koehring Concrete Paving Mixer, capacity 14 cu. ft.

One Austin Cube Concrete Paving Mixer, capacity 9 cu. ft.

One 20 h.p. Case Traction Engine.

All of above used only a few months and in perfect condition.

Apply Box 831, Contract Record, Toronto, Ont. 29-t.f.

Some Good Machines

Buckeye Trenching Machine, 12 in. x 4½ ft, A1 ... ... $700

Buckeye Trenching Machine, 27 in. x 8 ft.; just through shops; as good as new $2,500

Parsons Trenching Machine, 2 ft. x 5 ft. to 20 ft. deep. A1 ... ... $3,500

Thew No. 0 Steam Shovel. Overhauled by Thew Manufacturers last year. A1 ... ... $2,800

TRACTION ENGINE

Located in Canada, 30 H.P.

undermounted, double Avery machine, coal burner with rear mounted Steel Water Tank. Also an Avery Steel Water Tank on truck with pump. Cost, new, $3,575. This is in first-class condition $1,800

WHAT DO YOU NEED IN SECOND-HAND EQUIPMENT?

TRY US!

WILLIS SHAW MACHINERY CO.

La Salle Street, Chicago. Ill.

Situations Wanted

Architectural Draughtsman open for engagement. Capable Superintendent, having had large practical experience.

Moderate remuneration to get established. Reliable. Box 849, Contract Record, Toronto. 33

Position Wanted—Engineer, electrical and mechanical, age 26, with extensive workshop experience and University training, desires suitable engagement; more particularly on the sales staff. References. Box 851, Electrical News, Toronto, Ont. 16-17

Position Wanted Engineer, electrical and mechanical, age 26, with extensive workshop experience and University training, desires suitable engagement, more particularly on the sales staff. References. Box 850, Contract Record, Toronto, Ont. 32-33

Residences

eral contractor, W. H. Yeates, Jr., 24 Leeming St. Roofing, Wm. Findlay, 317 Aberdeen Ave.

Medicine Hat, Alta.
Six residences, cost $3,500 each, Central Park, for Huggins & Porter, Bennet Bldg, Toronto St. Architect and builder, A. Montgomery, 14 Hull Block. Two storeys, 26 x 32 each, frame construction. Foundations in.

Montreal, Que.
Flats, cost $30,000, Park ave., for E. Goldfine & Chananie, 3 Ontario W. Architects, G. Bail and E. Vincent, 102 Stadacona. General contractor and carpenter, G. Bail. Brick, S. Langlois, 394 Forsythe street. Roofing, heating, plumbing, electrical work, Jos. St. Amand, 109 Laurier W. Plastering, H. Tremblay, 1360a Amity. Painting, Brosseau & Laurendeau, c/o gen. contractor.

Alterations and addition to residence, cost $10,000, for Lady Hickson, 20 Ontario Ave. Architects, Nobbs & Hyde, 49 Beaver Hall Hill. General contractors, Bennell Bros., 341 Guy St., doing all the work.

Toronto, Ont.
Det. residence, cost $5,500, Glen Road, for J. S. Vancamp, 109 Langley. Architect and general contractor, R. Perkins, 576 Palmerston ave. Two storeys, 28 x 42, stone foundation, brick and steel construction. Excavating started.

Det. residence, cost $35,000, Clarendon & Russell, for D. K. Ridout, 85 Bay St. Architects, Langley & Howland, Continental Life Bldg. Masonry, Wood & Son, 611 Manning ave. 2½ storeys, 45 x 66, stone foundation, brick, stone, hollow tile and steel construction. Excavation started.

Power Plants, Electricity and Telephones

Brandon, Man.
Telephone exchange, $100,000. Manitoba Government Telephones. Dist. Supt., C. H. Snider. Damage covered by insurance.

Dundas, Ont.
Power house, for Ontario Hydro-electric Commission. Sec., W. W. Pope, Bay and Richmond, Toronto. Engineer, F. A. Gaby, Bay and Richmond, Toronto. General Contractors, Wells & Gray, Confed. Life Bldg., Toronto. Equipment, Can. Westinghouse Co., Hamilton.

Forest, Ont.
Electric power house, cost $6,000, planned by Town Council. Clerk, Richard Karr. Engineer, H. A. McLean, C.E., Sarnia. General contractor, Wm. Ross. Boilers and engines, E. Leonard & Sons, London, $4,385. Electrical work, Can. Westinghouse Co., Hamilton.

London, Ont.
Power house, for Ontario Hydro-electric Commission. Sec., W. W. Pope, Bay and Richmond, Toronto. Engineer, F. A. Gaby, Bay and Richmond, Toronto. General contractors, Hyatt Bros., 94 Egerton. Equipment, Can. Westinghouse Co., Hamilton.

Medicine Hat, Alta.
Telephone exchange building, cost $85,000, 5th Ave. and Ottawa Sts., planned. Tenders received by Deputy Minister, W. J. Harmer, Edmonton, Prov. Govt. Dept. of Railway, Telephones and Telegraphs, for excavation, concrete footings and walls. Specifications at office of Provincial Architect, Edmonton. Three stys., stone and brick construction.

Orillia, Ont.
The Dom. Govt. will build dam and power house at Swift Rapids, also transmission line to supply power to Orillia.

Regina, Sask.
Power house, cost $30,000, Lakeview, planned by City Commissioners. City Commissioner, L. A. Thornton. Supt. of Light and Power, E. W. Bull. Architects, Storey & Van Egmond, Credit Foncier Bldg. 174 x 130, concrete foundation, brick and stone construction.

St. Thomas, Ont.
Power house planned for Ontario Hydro-electric Commission. Sec., W. W. Pope, Bay and Richmond, Toronto. Engineer, F. A. Gaby, Bay and Richmond, Toronto. General contractor, Geo. Ponsford. Equipment, Can. Westinghouse Co., Hamilton.

Toronto, Ont.
Dam and power house for Hydro-electric Power Commission. Sec., W. W. Pope, Continental Life Bldg. Engineer, F. A. Gaby, Continental Life Bldg. Stop log winch and Headgate mechanism. Wm. Kennedy & Son, Owen Sound, awarded contract for work, etc., on Wasdell's Falls, on Severn River.

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ADMIRABLY ADAPTED FOR

HOUSE SUPPLY

BOILER FEEDING

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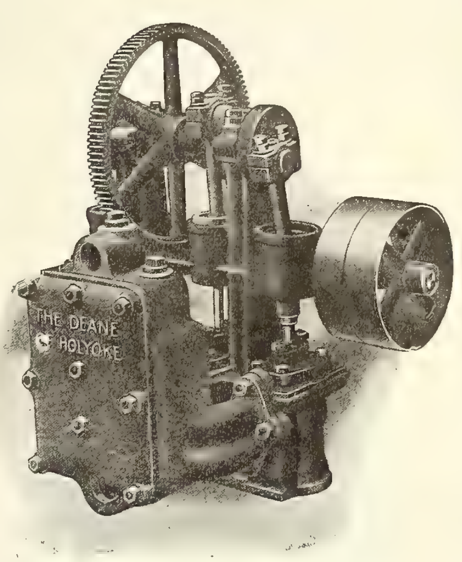

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Hoisting Machinery a Specialty

Let us quote on your requirements. *All Work Guaranteed.*

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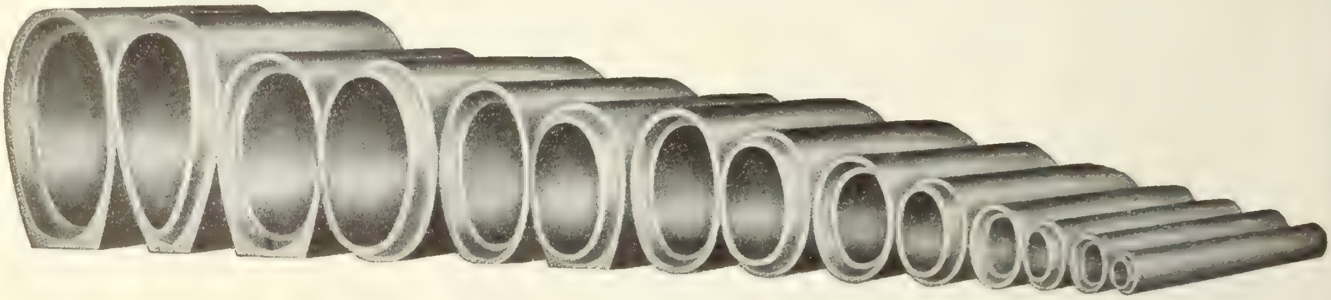

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Catalogue and prices on application.

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EQUIP YOUR CELLAR

with one of our "Majestic" Coal Chutes which is the neatest and best equipment for any cellar. It is easily installed in either new or old houses. It permits coal, wood or vegetables to be put into the cellar without disfiguring the building in any way. And unlike a glass window it cannot be broken. The hopper can easily be removed if desired to put in very coarse coal or wood, or if a waggon chute is used. It swings back into the chute and allows the door to be closed. The door is made to lock when opened upward, and protects the wall or siding above the chute, and can be released only when closed. We make three standard sizes. There's a size that's just right for your cellar and your requirements. No. 1—22 x 16 x 13. No. 2—27 x 16 x 13. No. 3—33 x 22 x 18.

Send for our illustrated booklet, it shows and describes our full line of Coal Chutes

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Toronto Representatives: Black Building Supply Co., Mail Building
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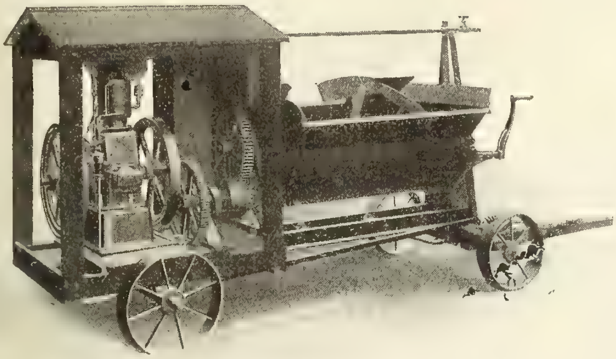
One Mixer for all Work



The Blystone Mounted Mixer with Power

You will do your concrete mixing quicker and cheaper with the Blystone Mixer. This is not what we alone say but what all users say. This mixer is adaptable to all kinds of work. We are willing to prove its advantages to you—give us the opportunity.

Simple, Durable and ALWAYS READY

Send for Catalogue

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Steel Ceilings and Walls

How many kitchens and bathrooms are there in your locality? Every one of them ought to be furnished with "Metallic" Steel Ceilings and Walls; and this certainly offers you a splendid opportunity to get a lot of profitable business.

These fire-proof ceilings and walls are inexpensive, are sanitary and easy to clean. You don't have to carry them in stock; our catalogue H and price list is all you need.

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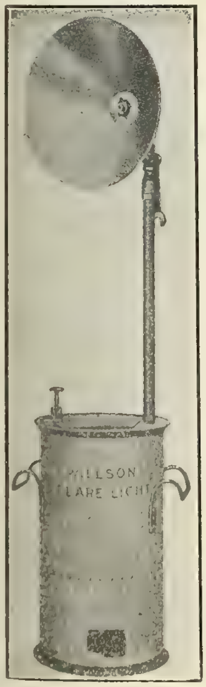
TORONTO AND WINNIPEG

Contractors' Acetylene Flare Lights



Made in Two Sizes

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8,000 Candle Power, operates 12 Hours on 18 lbs. Carbide.

Price F.O.B. Ottawa $95.00.

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1,000 Candle Power, operates 12 Hours on 8 lbs. Carbide.

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Manufactured by

International Marine Signal Co. Limited
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1—40 foot Steam Yacht
1—No. 5 Champion Stone Crusher
1—10 Ton Stiff Leg Derrick
1—7x12 Marsh & Henthorn Hoist D. D. and Swinger.
1—35 H.P. Locomotive Type Boiler
1—30 H.P. Locomotive Type Boiler
1—1/2 Yard Smith Concrete Mixer
1—12x16 Waterous Stationary Engine
1—7x12 Beatty Hoist D. D. and Swinger.

The above machines are but slightly used and are in good working order.

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Manufacturers of SUPERIOR

Hoisting Engines

Derrick Swingers, Material Elevators, Marine Engines and Boilers

Our Hoisting Engines and Boilers are strictly up-to-date in both design and construction, built to gauges, templates and jigs, but we are rarely ever called upon to furnish repair parts for our Engines. All wearing surfaces are extra large and parts proportioned to withstand maximum stresses with an ample factor of safety. All iron castings are extra tough having a percentage of steel added in their make up. Our hoisting Engines are built for business and built to last.

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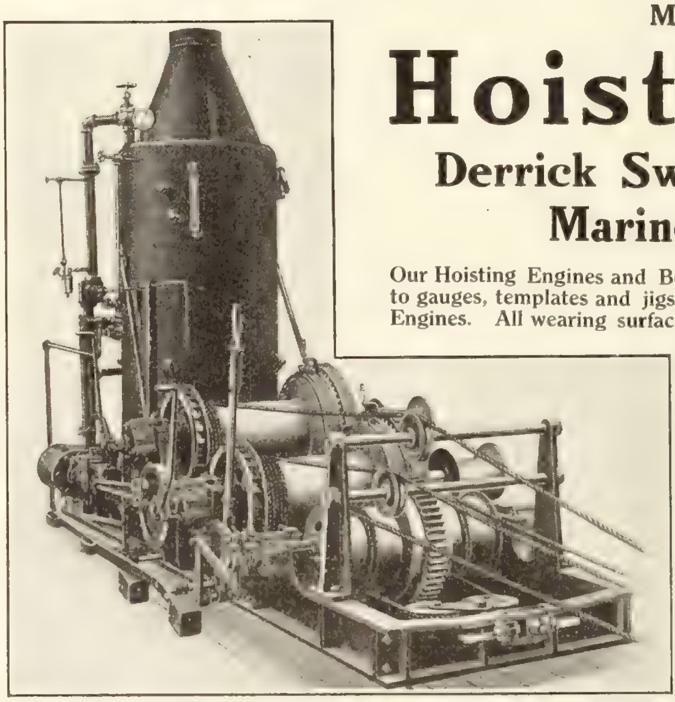
Our aim is to keep all standard sizes in stock at our Goderich Works, and if we cannot supply you from Stock, our facilities enable us to put through your order with least possible delay.

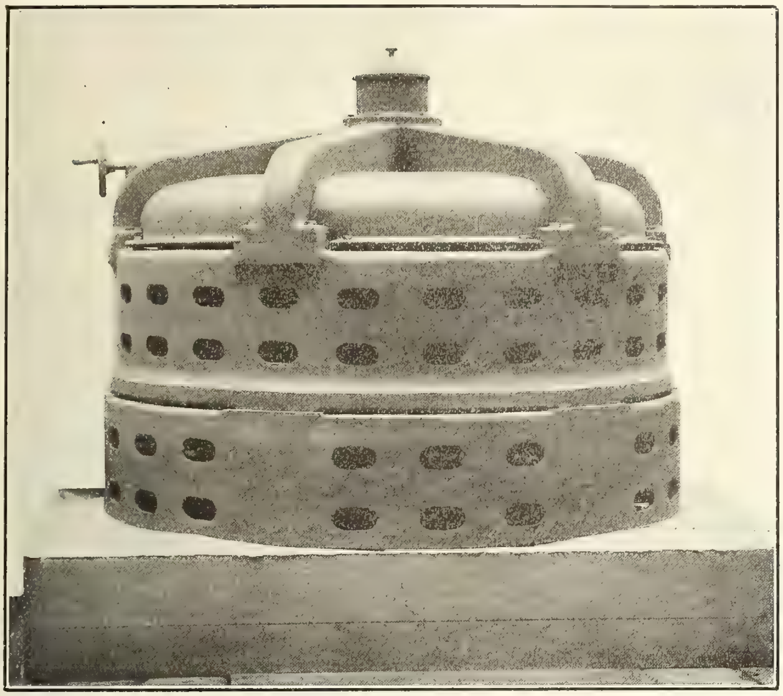
Write us for prices and deliveries

Doty Marine Engine and Boiler Co., Ltd.
Works: GODERICH, Ont.

Doty Engine Works Co. of Winnipeg Ltd.
Foot of Water Street, WINNIPEG, Man.



The above half tone illustrates our Standard double Drum double Cylinder Hoisting Engine with Derrick Swinger attached.



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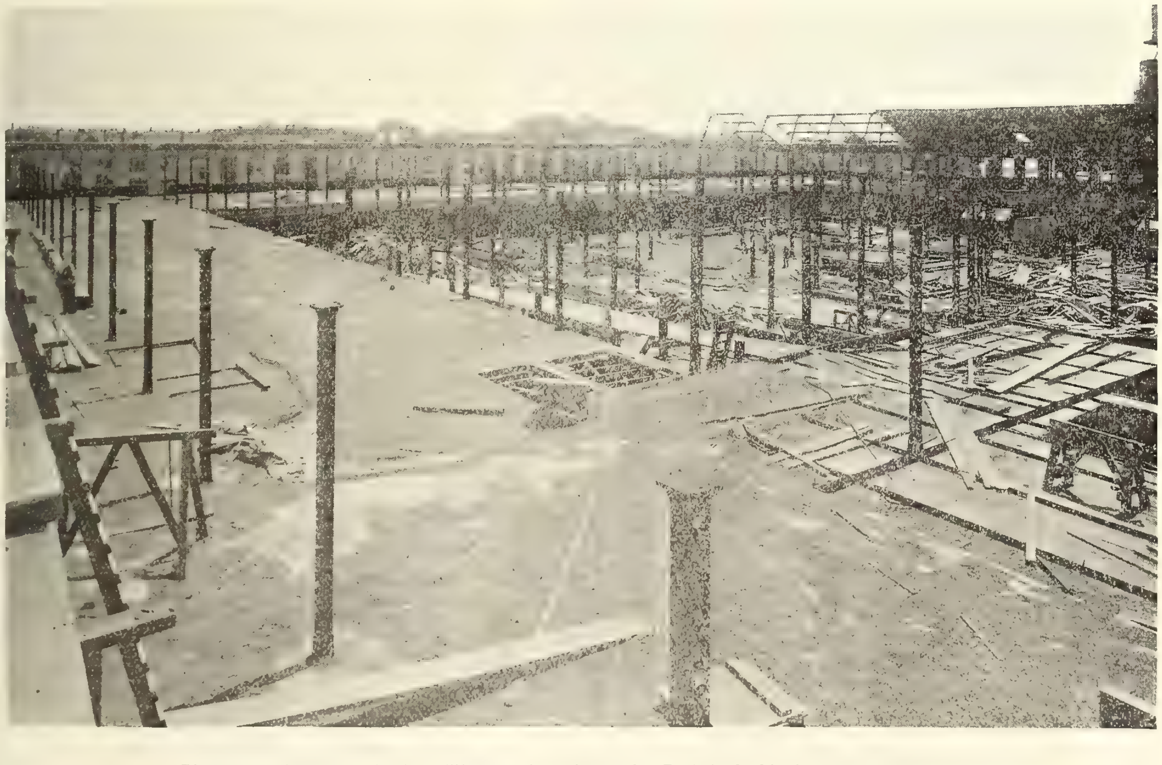

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For walks—curbs—curb and gutter combined—driveways, roads, pavements, etc.
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THE Underwood embodies in one machine all that can be expected in a typewriter. It is sold at the price which should be paid for a machine of its quality.

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A few dollars spent in advertising your proposals in the
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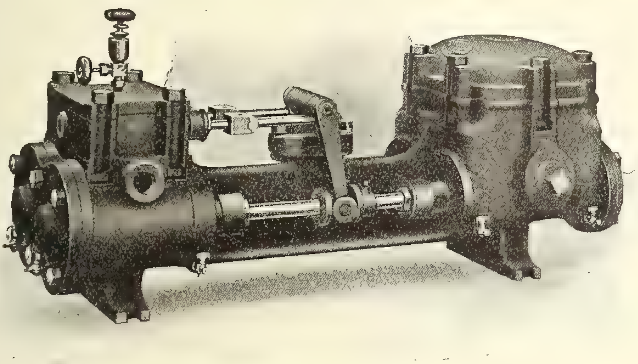

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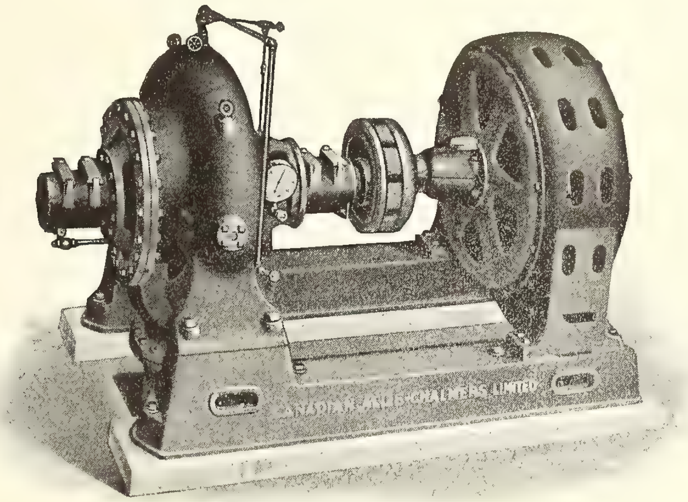
These new standard pumps can be furnished in sizes to give any quantity of water desired up to 1700 Imp. gallons per minute against a working pressure of 150 lbs. per square inch, with a steam pressure of approximately 100 lbs. per square inch.

Centrifugal Pumps

Mather and Platt turbine pumps built for all purposes and any head up to 2,000 ft. Standard pumps to 20,000 Imp. gallons per minute.



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Is used so largely because it has behind it a successful reputation of 25 years. Its use insures either exposed or enclosed surfaces, against rust.

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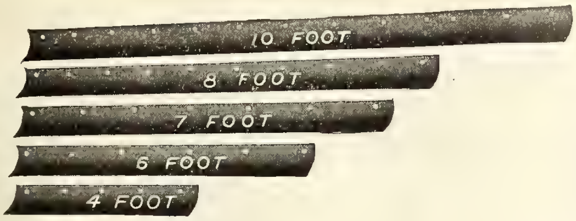

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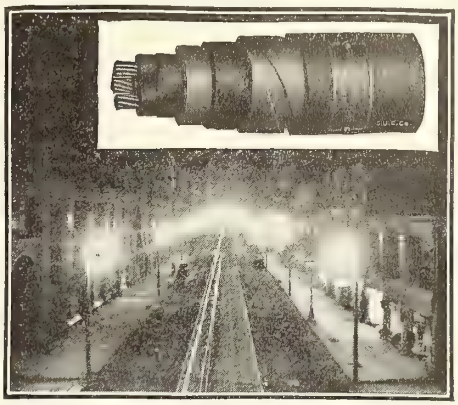

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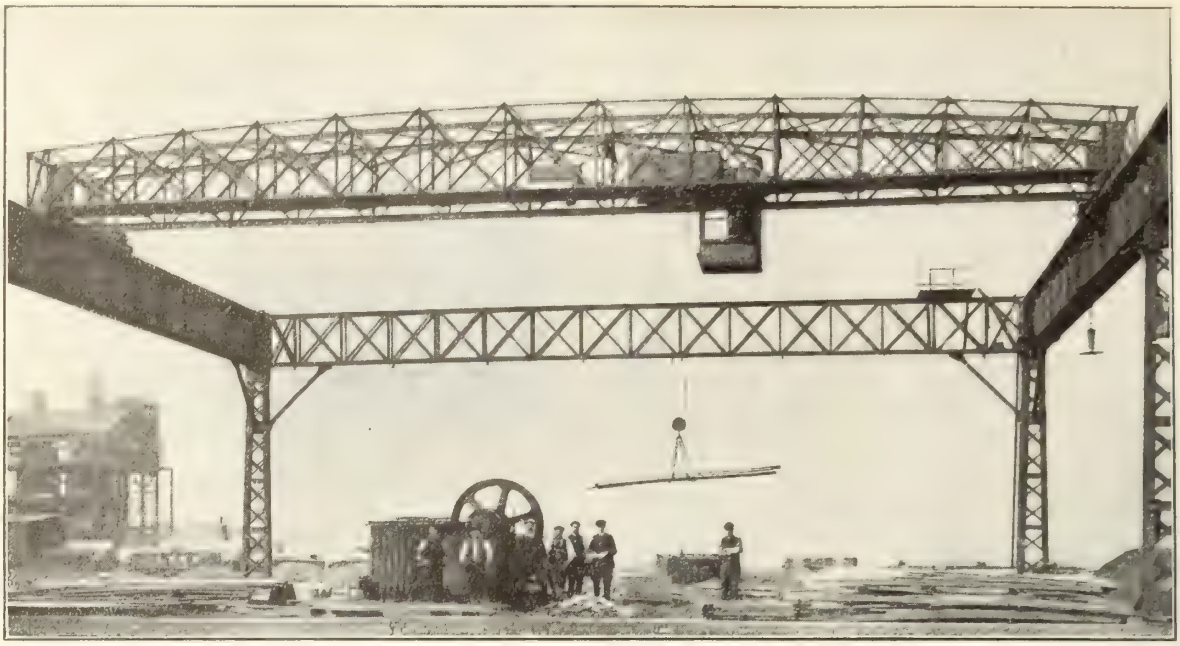

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Wayne County's 70 Miles of Concrete Roads Prove that the Baker Plate Has Solved the Expansion Joint Problem.

"The only surface repair required on our concrete roads has been on the roads first constructed, where the joints were not protected with the 'armor' plates."

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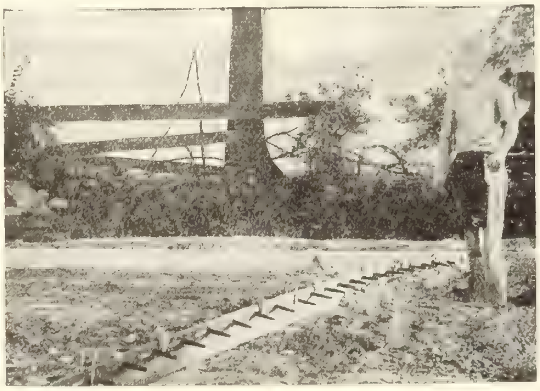
We guarantee Baker Armor Plates to be perfectly crowned as specified, and entirely free from defects of manufacture.



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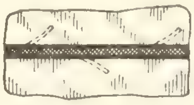
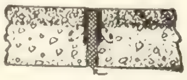
Our booklet on concrete pavements illustrates and describes pavements in many different cities, giving cost data and describing in detail the methods used. Complete specifications for the ideal concrete pavements are included as well as instructions for installing Baker plates. This booklet is sent without charge to responsible engineers contractors and highway officials.



Longitudinal Section Showing Joint.



Cross-Section of Pavement Showing Expansion Joint.

R. D. BAKER CO., 73 Home Bank Bldg.
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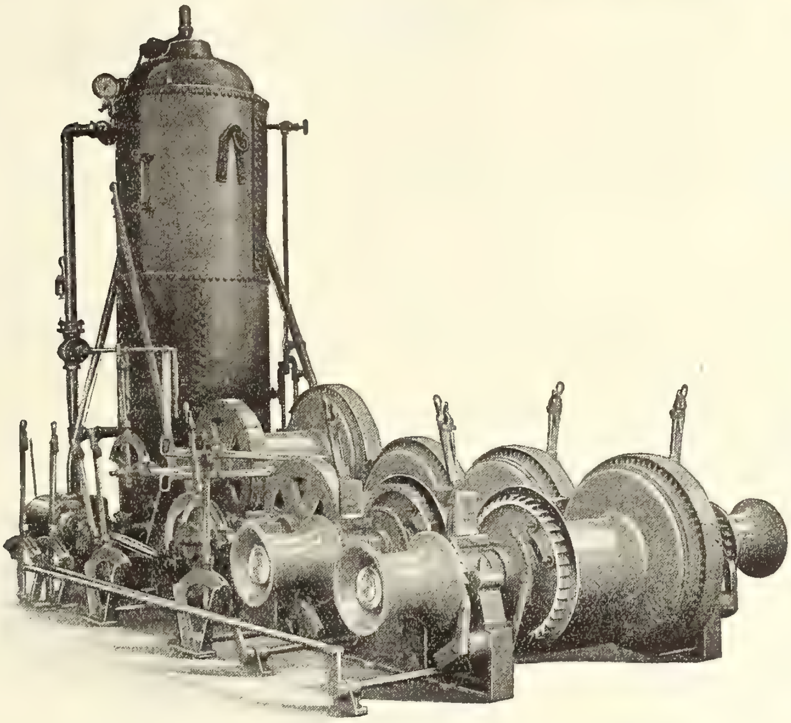

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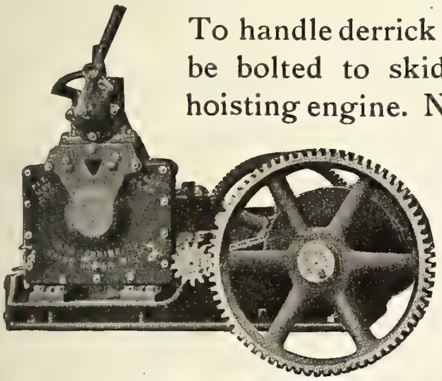

To handle derrick booms. Can be bolted to skids in front of hoisting engine. No dead center.

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Send us your specifications for Cut Stone work

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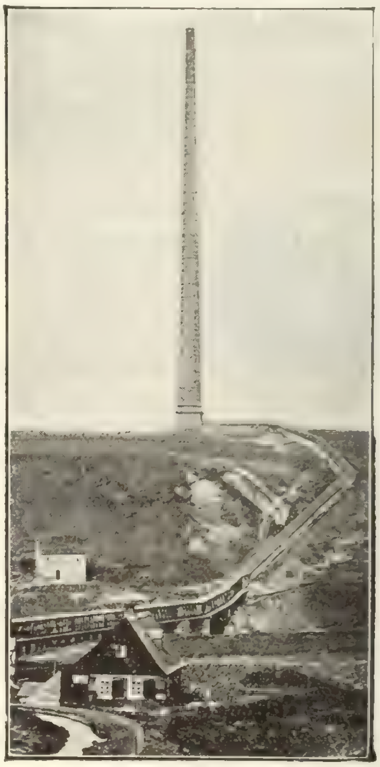

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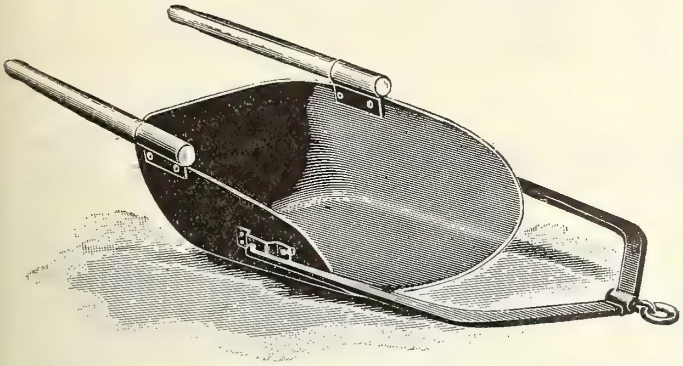

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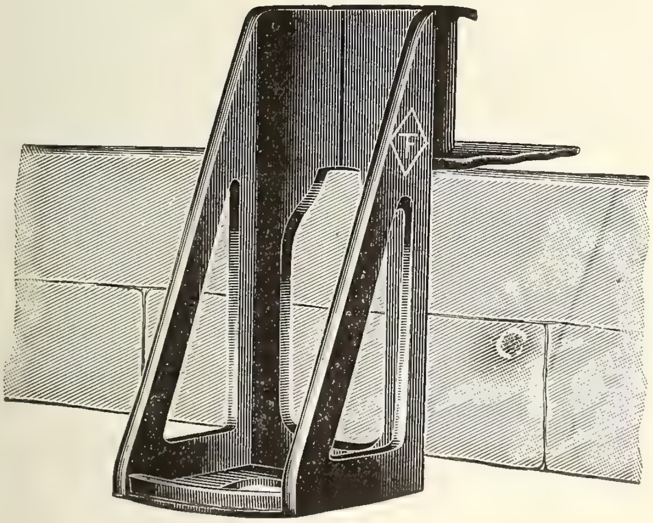

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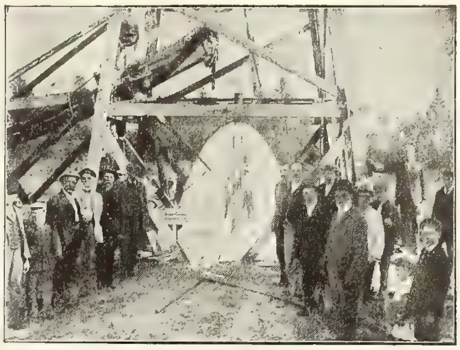

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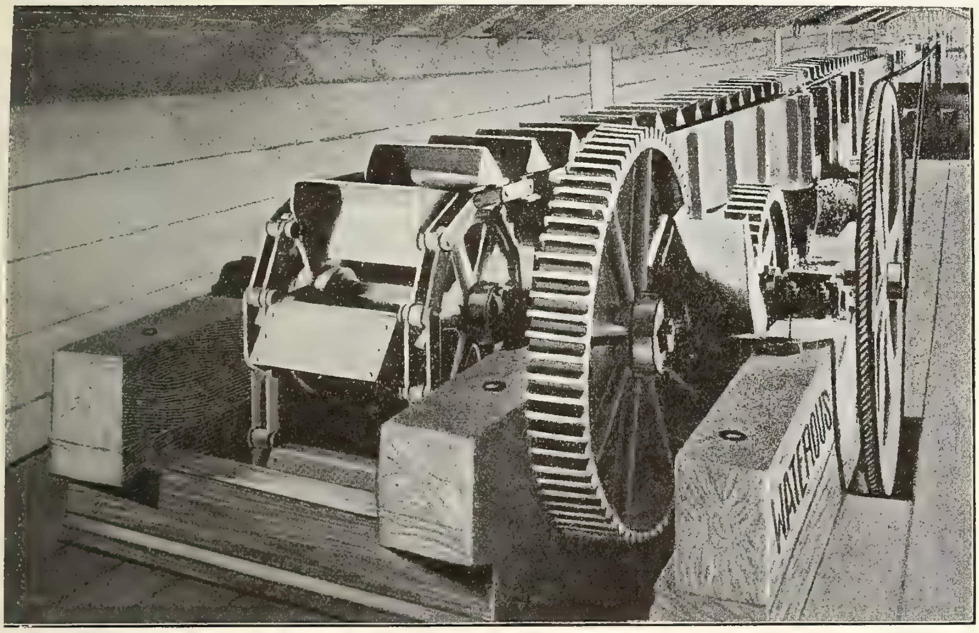

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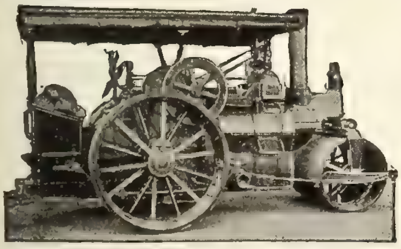

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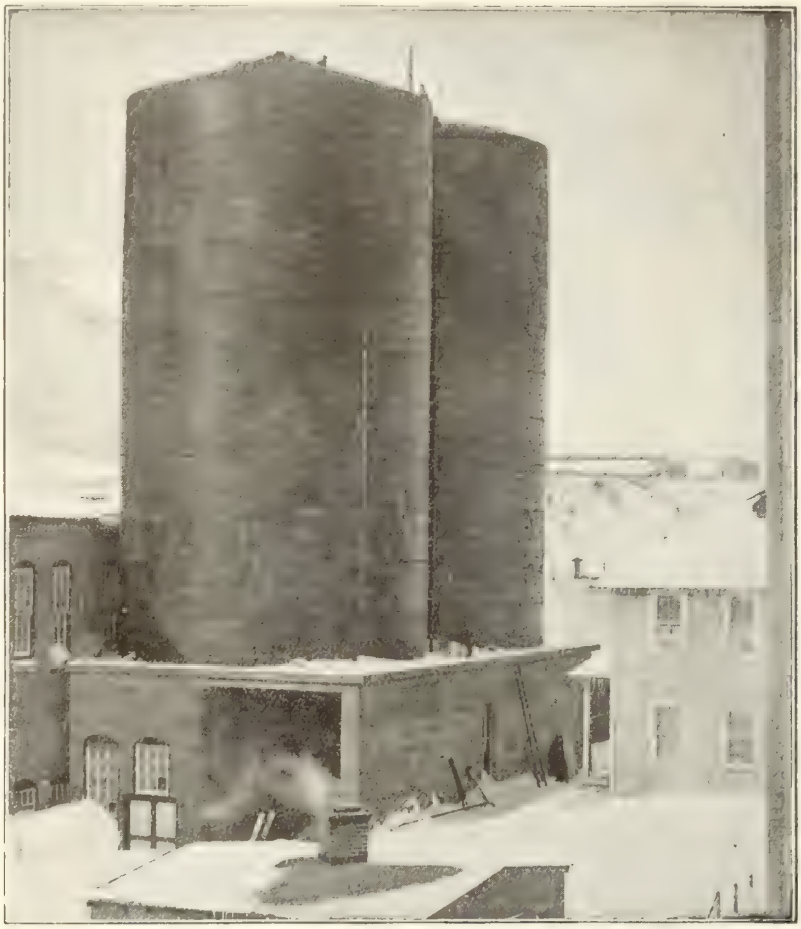

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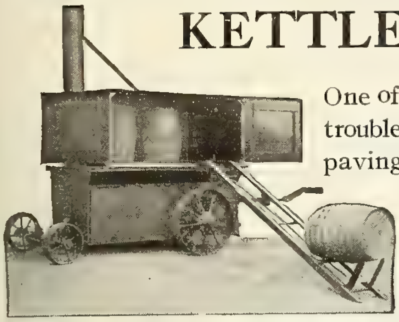

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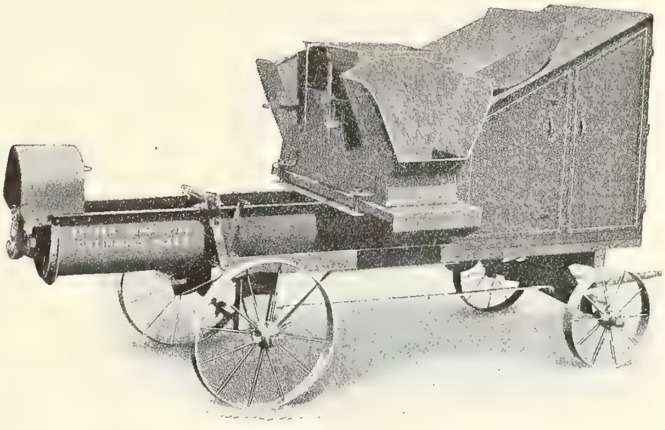

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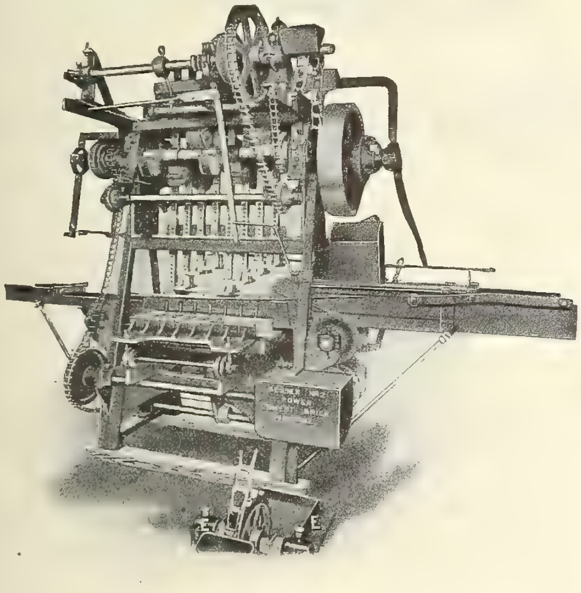

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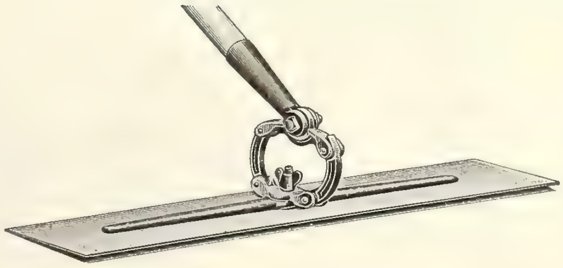

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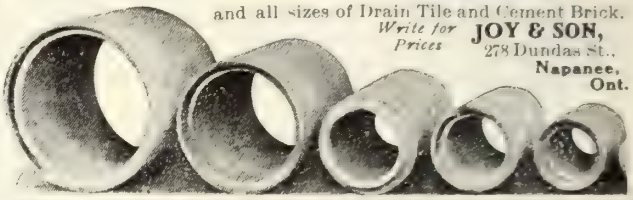

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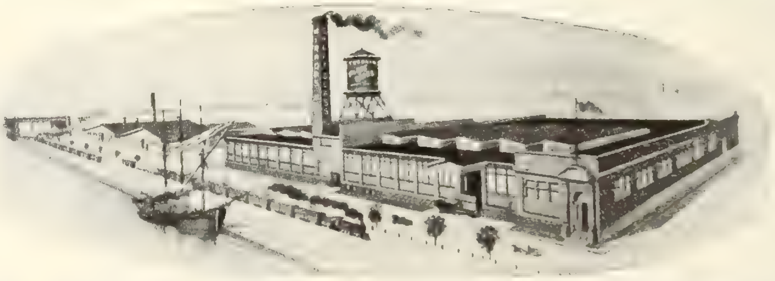

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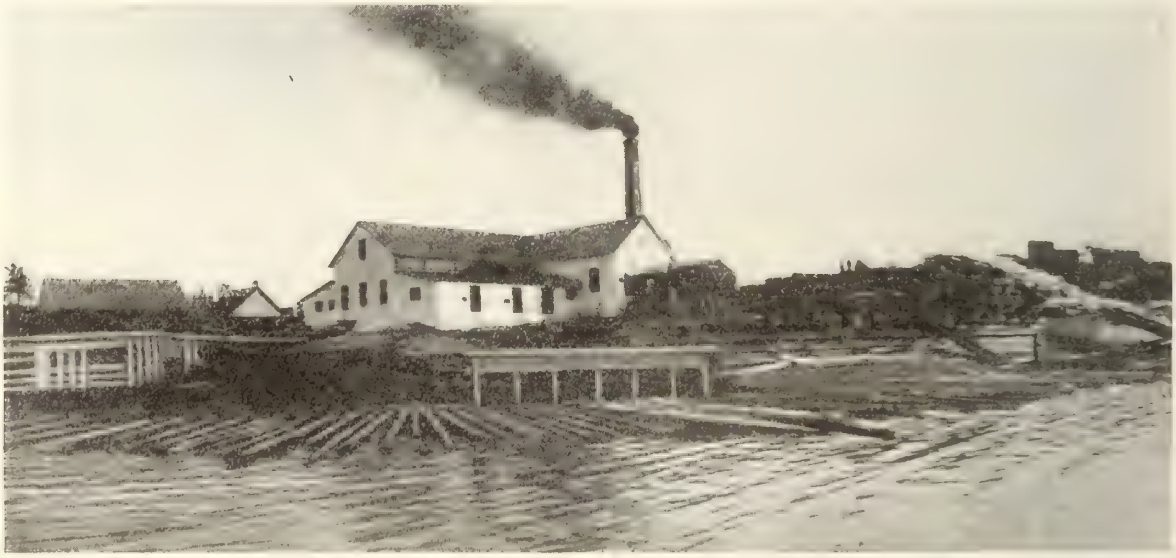

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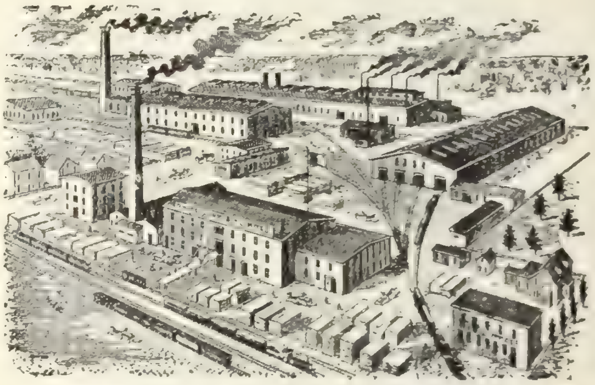

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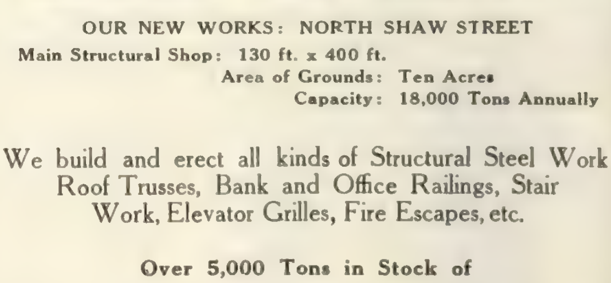

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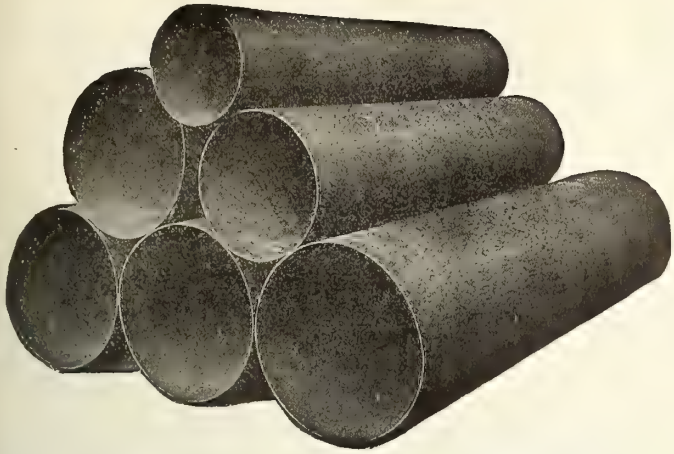

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30 INCH DIAMETER
LAP WELDED STEEL PIPE

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The Des Moines Hemispherical Bottom Steel Tanks and Towers

have been used and approved by nearly all leading Engineers. They are undoubtedly the most economical means of storing water at an elevation.

We have built many of these in Canada the United States and Mexico. Estimates cheerfully furnished.

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Standard Steel Construction Co. Limited
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Manufacturers and Erectors of

Steel Buildings and Bridges

If you are intending to purchase **Steelwork** for any purpose, it will be to **your interest** to permit us to quote.

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NEW WESTMINSTER, B.C.
MANUFACTURERS OF
DOUBLE WIRE WOUND

AND
CAST IRON SPECIALS, VALVES, HYDRANTS, ETC.

"American" Enameled Brick

Fireproof and Sanitary

Durability, Beauty and Sanitation are important factors to be considered by the prospective owner.

Write for samples—Miniature or full size—in all standard colors. Prompt attention given formal requests.

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Contractor for **Cold Storage Buildings, Abbatoirs, Creameries** and similar structures where the insulation or waterproofing requirements call for special attention.

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"TAMCO" Crushed Stone in all sizes, for all purposes. "Roman" building stone. "Milton" pressed bricks. Sanitary flooring, stone crushers, fire engines, &c. T. A. MORRISON & CO. 204 St. James Street, Tel. Main 4532. Montreal.

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MANUFACTURERS OF

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Damage caused by ice which we are at present repairing

OUR SCOPE:

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INSPECTED AND LABELLED UNDER THE DIRECTION OF THE UNDERWRITERS LABORATORIES (INC.)
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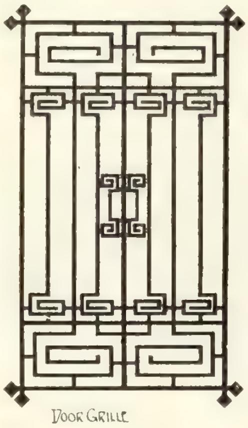

Window and Door Grilles

We execute Architects Designs in Wrought Iron, Bronze or Brass.

The workmanship and finish of our grill work is of high standard.

We illustrate a number of designs in our Catalogue that offer useful suggestions.

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SOLE producers of the Beautiful Royal Dominion marble quarried at South Stukely, Que. A card or 'phone call will bring our representative to submit figures on any class of marble work. Address all letters to the Company P.O. Box 1166, Montreal.

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¶ Please take note that our mills and Head Office are now located in Lyster, Megantic Co. where all correspondence should be addressed, and orders as in the past will be attended to promptly.

Lyster Wood Box Turning Enamelling Company, Limited
LYSTER
Successors to Automatic Wood Box & Turning Co., St. Romuald, Que.

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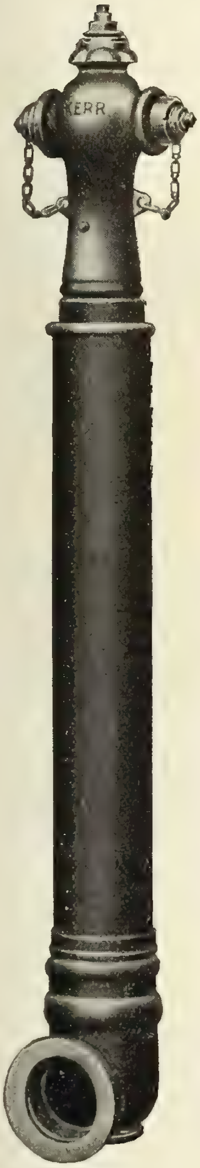
Hydrants and Gate Valves

are made with Hub for Cast Iron, Wood or Steel pipe spigots. They have full area of waterway, and are strong, compact and modern in design and construction.



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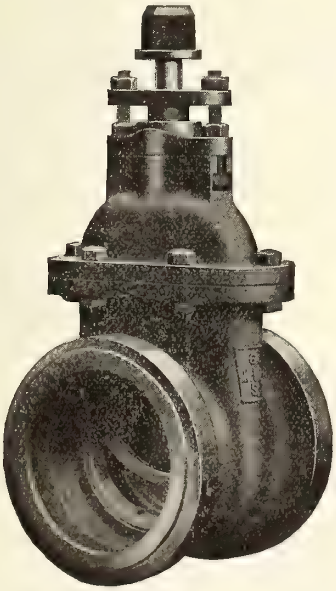

6″ Hubbed

Send us your Specifications and Enquiries.

Prompt attention given.

THE **KERR ENGINE CO.**
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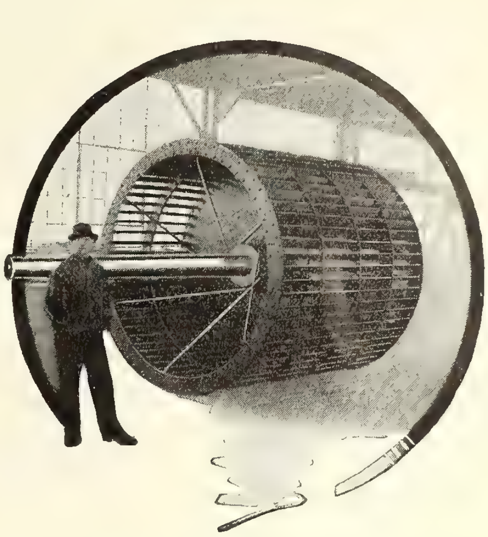
WALKERVILLE, ONT.



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Ventilating Fan

The illustration shows a double inlet "Sirocco" Fan with a capacity of 270,000 cubic feet of air every 60 seconds at 5″ water gauge.

A "Sirocco" Fan will deliver twice as much air as the ordinary steel plate fan of the same wheel diameter. Save one-half the space and one-third the power.

"Sirocco" Fans and Blowers are made in sizes to deliver from 75 cubic feet per minute to 1,000,000 cubic feet per minute.

Our Engineering Department will gladly co-operate with you in the selection of the proper equipment for YOUR needs.

Let us tender on your next requirements. Bulletin No. 3401 is descriptive of the construction and operation of "Sirocco" Fans. You should have a copy.

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W. P. EDDY, 214 Donald St., Winnipeg
S. S. Clarke, 605 2nd St. West, Calgary

Current Prices of Building Material

BRICKS

The following are wholesale prices delivered at Toronto:—

	Per M
No. 1 dry pressed red brick	$18 00
No. 1 dry pressed buff brick	18 00
Red Stock Bricks	13 00
Grey Stock Bricks	13 00
Wire cut bricks for foundation work ...	12 50
Porous terra cotta bricks	15 00
No. 1 enamelled bricks, all colors, from	$80 00 to $150 00
Sand Lime Bricks	11 00

LUMBER (Building Material)

Hemlock Lumber—

2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$27 00	
2 x 4 to 2 x 12, 16 ft.	27 00	
2 x 4 to 2 x 12, 18 ft.	30 00	
1 in. Hemlock, No. 1	26 00	28 00
No. 1 Hemlock Decking	26 00	28 00
No. 2 Hemlock dimension and 1-in.	20 00	22 00

Pine—

1 in. common pine 8 to 12 in. wide rough	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
⅞ x 8 and 10 in. pine shelving..	36 00	42 00
⅞ x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine desking D2S	30 00	
Spruce Decking	28 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

Pine trim for paint finish—

4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8-in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

Shingles—

XXX B. C. Clear Shingles per M.	3 90
N. B. Extras	3 75
N. B. Clears	3 10
No. 1 pine lath, per M.	5 00
No. 2 pine lath	4 50
No. 1 spruce lath	4 00

Cedar Posts—Fence—

5 in. at small end, each	30
7 in. at small end, each	35
Hemlock lath	3 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

	Star	D.D.
10 to 25 united inches	$4 25	$ 6 25
26 to 40 "	4 60	6 75
41 to 50 "	5 10	7 50
51 to 60 "	5 35	8 50
61 to 70 "	5 75	9 75
71 to 80 "	6 25	11 00
81 to 85 "	7 00	12 50
86 to 90 "		15 00
91 to 95 "		17 50
96 to 100 "		20 50
101 to 105 "		24 00
106 to 110 "		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for box lots:—

MONTREAL

	Star	D.D.
25	$3 25	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
90		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 u.i.	$3 50	$5 00
26/40	3 75	5 50
41/50	4 25	6 25
51/60	4 75	7 00
61/70		8 00
71/80		9 00
81/85		10 00
86/90		11 00
91/95		13 00
96/100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

STEAM FITTERS' AND PLUMBERS' SUPPLIES

Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock ...... net $1.85

No. 4½ Fuller's .... net $2.50

Square head brass cocks, 65 per cent.

Lead Pipe

Lead pipe, $7.50, less 5 per cent.; lead waste, $9.00, less 5 per cent.; caulking lead, 7 cents per lb.; traps and bends, 40 per cent.; pig lead, 5¾ cents per lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.28	¼ inch	$3.18
⅜ "	2.28	⅜ "	3.18
½ "	2.72	½ "	3.57
¾ "	3.28	¾ "	4.43
1 "	4.85	1 "	6.55
1¼ "	6.56	1¼ "	8.86
1½ "	7.84	1½ "	10.59
2 "	10.55	2 "	14.25
2½ "	16.67	2½ "	22.52
3 "	21.80	3 "	29.45

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

Soil Pipe and Fittings

Medium and extra heavy pipe and fittings, up to 6-inch, 60 and 5 per cent.

7 and 8-inch pipe, 45 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

CEMENT, STONE, STEEL, Etc.

Cement, barrel lots, in bags, delivered Toronto, bags extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ¾-inch, $1.45.

Burnt River rubble stone delivered, $17 to $18 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¾ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

Free stone delivered, $17 to $18 per toise.

Brown coursing stone, delivered, $3.75 per yard.

Grey coursing stone, delivered, $2.50 to $2.75 per yard.

Sand, for cement or brick work, $1.15 a cubic yard, f.o.b. Toronto, C. P. R. sidings.

Sand, for cement or brick work, 90c to $1.05 a cubic yard, f.o.b. Toronto, G. T. R. sidings.

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

Steel channels and beams, angles and plates, $2.65 to $3.00 per 100 pounds, delivered f.o.b. Toronto.

Hard Wall Plaster, unsanded, from $7.00 to $8.50, bags extra; sanded, $4.50 in car lots; hydrated lime, $9.00 in car lots.

Lime per cwt., delivered, not less than 1,500 lbs. 33 cents; white, 43 cents.

Plaster of Paris, Anchor and Crown Brands, $1.50.

Manilla Rope, best, per pound, 12½ cents.

PAINT AND OILS

Pure White Lead, ground in oil, $8.50 per 100 lbs.

Boiled Linseed Oil in bbls., 64c per gal of 9 lbs.

Raw Linseed Oil, in bbls., 61c per gallon.

Turpentine, in barrels, 56c per gallon.

Pure Red Lead, dry $6.50 to $7.50 per 100 lbs.

Putty, pure linseed oil, in bulk, bbls. 3½c.

Putty, pure linseed oil, in 25-lb. tins, 4c.

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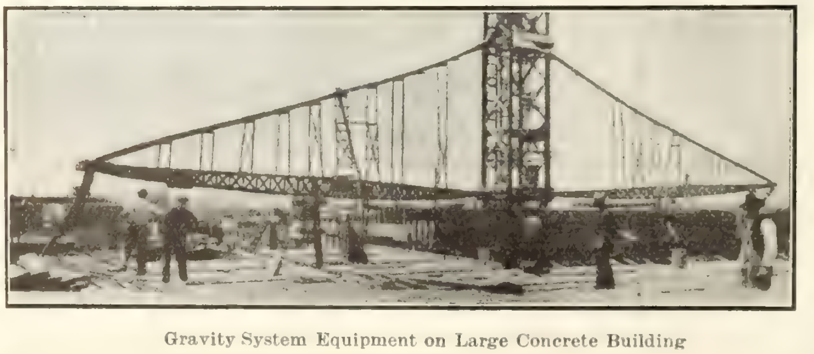

Gravity System Equipment on Large Concrete Building

A system that improves the concrete and reduces the cost.

Information gladly furnished and estimates given on any work.

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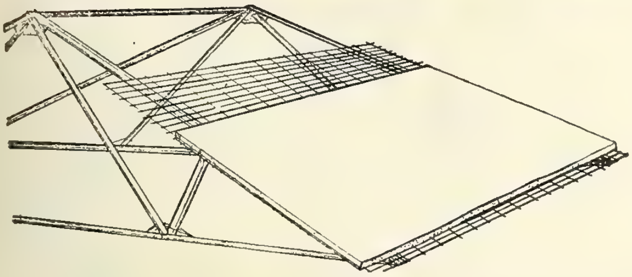
Concrete Reinforcement



Our Bonding is a Crimped STEEL WIRE Fabric

Can be made in any Length or Width to suit you.

We claim in the erection of roofs and floors our continuous reinforcement has no superior, inasmuch as it knits the entire mass into an actual monolithic slab, weak at no point and so tied together that in case of accident from any cause whatever, no single section would fall but would be sustained by carrying capacity of wires running in continuous lengths over top of roof trusses or purlins.

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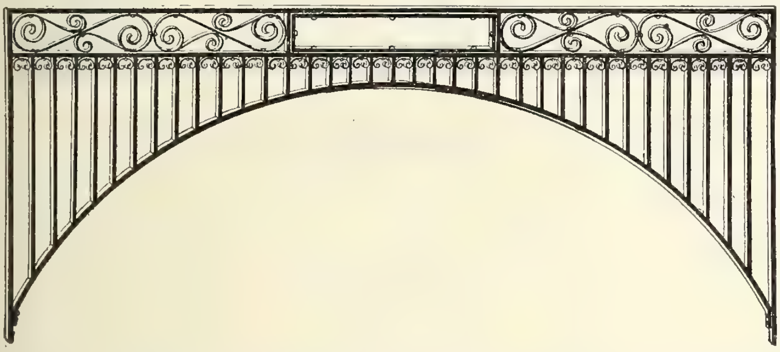

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Ornamental

Wire and Iron Work

SEND US YOUR ENQUIRIES

We specialize in

Jail and Prison Work

Canada Wire & Iron Goods Co., Hamilton

Nova Scotia Steel & Coal Company, Ltd.

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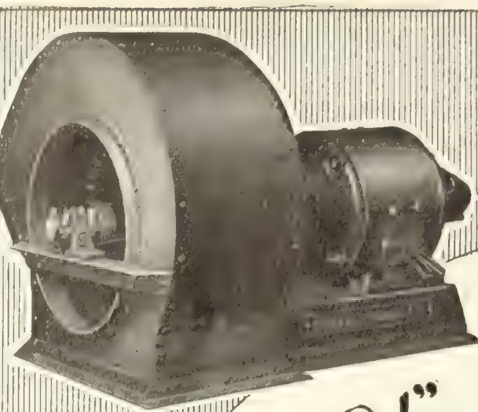
That their new steam-hydraulic forge shop is now in operation, as also is their recently installed "Harmet" fluid compression-plant.

These improvements bring "Scotia's" equipment abreast of the best foreign forges.

They are accordingly open to supply forgings of all shapes and sizes. Made of ordinary or fluid compressed open-hearth steel, and satisfying the most severe specifications.

For Prices and Particulars Apply to

Head Office - - New Glasgow, N. S.



"Buffalo" Fans

For Heating, Ventilating, Drying and Exhausting.

Ask our engineers to recommend the fan best suited to your requirements. Our designs include the new high-efficiency "*Conoidal*" multiblade fan, used extensively for heating systems, mine and tunnel ventilation, and the motor-driven *Steel Plate Pressure Blower*, giving pressures up to 24 oz. Both of these designs show higher efficiency than obtained with any similar types. We specialize in *direct-connected* units (motor, engine or turbine driven) for every service. These are distinguished by absence of belt troubles and the very lowest power consumption. Whatever your problem write us.

CANADIAN BUFFALO FORGE CO., Limited
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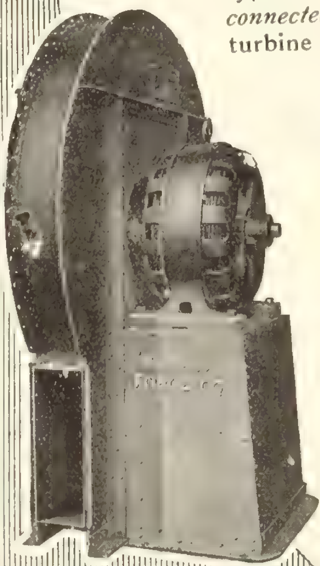
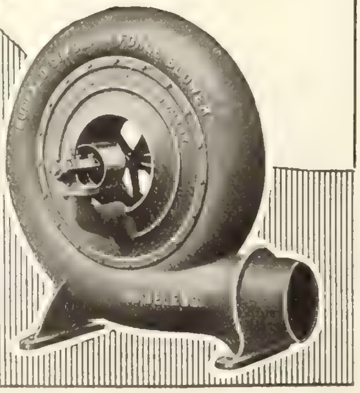
St. John Toronto
Winnipeg Vancouver





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"DEHYDRATINE"
For Water-proofing under the membranous method.

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For Water-proofing Concrete.

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For Surface Hardening Concrete Floors.

"SYMENTREX"
A Cement Coating—Makes Surfaces Water Shedding.
MADE IN COLORS

"These Trade Names protect you against the possible selection of inferior materials. Whether you prefer a water-proof paint or a compound, we can give you satisfactory assurance as to the reliability of these products."

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Minerva House, - Toronto
Write for Particulars and Architect's Hand Book (1913 edition)

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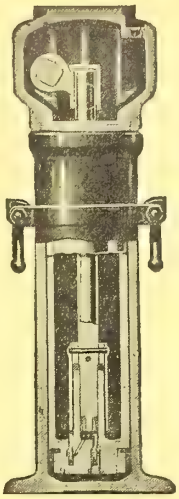
Reliability and Durability are only a Few Advantages of Forged Steel Construction



This sectional view clearly shows the remarkable simplicity of Duff-Bethlehem Design, and the absence of complicated features, as compared with other types using castings. The base and cylinder is a one-piece forging (not 2 castings screwed together with a packing at the joint). The pump socket is forged integrally with the ram bottom (all other types use 3 or more cast parts with packings at every joint). Packings—usually the most troublesome feature of Hydraulic jacks—are thus reduced to a minimum, only two being required.

Duff-Bethlehem Forged Steel Hydraulic Jacks

are made in a number of different styles, with capacities from 10 to 500 tons. They operate at any angle, horizontally as well as vertically, and one man can operate any size to its full capacity. Our Catalog No. 15 will interest you.

Write for a copy today

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THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED 6

Montreal Ottawa St. John Toronto Winnipeg Calgary Saskatoon Vancouver Victoria

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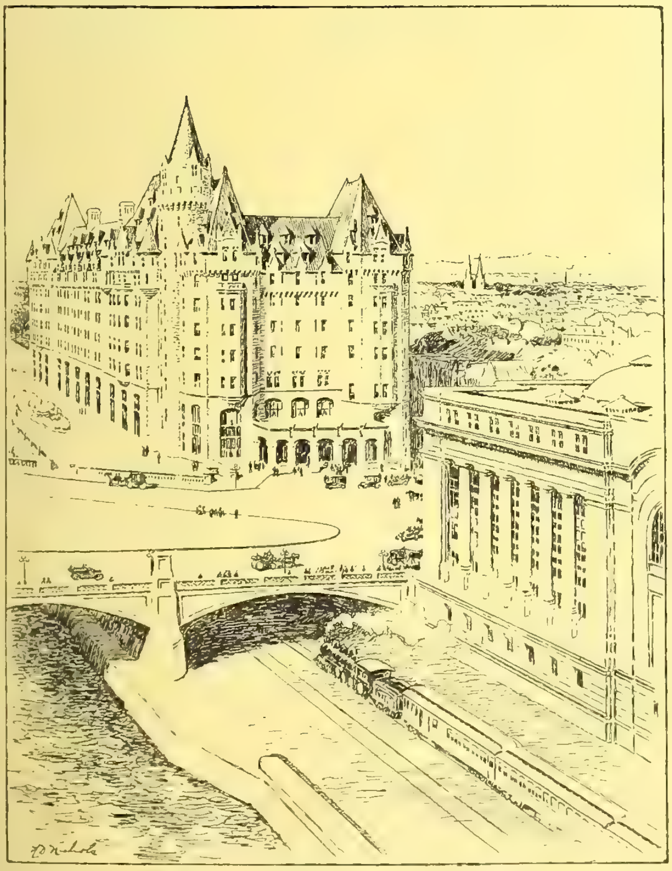


Across Canada with the

Imperial Wire & Cable Company, Limited

Toronto Montreal Winnipeg

Second of a series of advertisements showing buildings of national importance which have been wired with Imperial Wire and Cable Co's. Limited, wires.

This picture shows

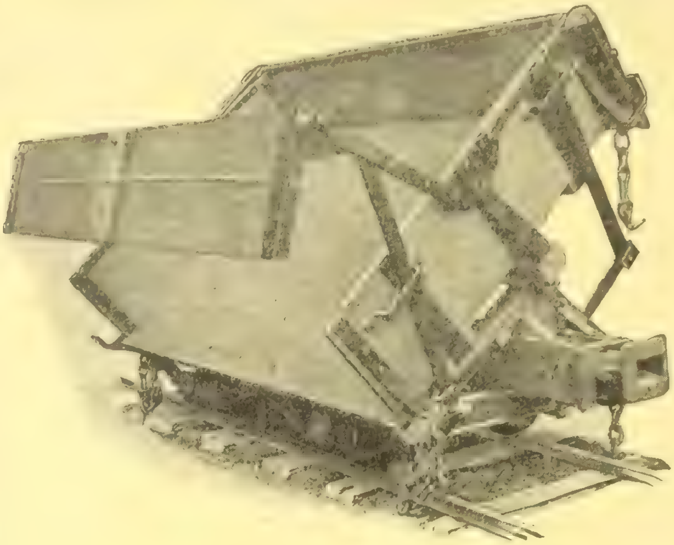
Chateau Laurier and Grand Trunk Central Station, Ottawa

These buildings were wired throughout with "Adanac" Rubber Insulated Wire.

Architects: Ross & McFarlane, Montreal.
Engineers: Westinghouse, Church, Kerr & Co., New York.
Electrical Contractors: Western Electric Co., New York.

Address our nearest office, **Montreal, Toronto, Winnipeg**

Alberta and British Columbia enquiries may be addressed to our Sales Agents, Northern Electric & Manufacturing Co., Limited, Calgary and Vancouver.



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&
JACOBS"

Dump Cars

Our Dump Cars will give you entire satisfaction. We can supply cars in all capacities for any practical gauge. Wheels are all properly chilled and the construction and material used are the best.
Our Cars are declared by steam shovel and car men to be superior to all others, both in construction and operation.

Let us have your enquiry, we would be pleased to submit full particulars and prices at any time.

"Davenport" Saddle Tank Locomotives

For Contractors and Quarry Service

Supplied in any size for any practical gauge track.

"Marion" Steam Shovels

For Railroads — Contractors — Brickyards, Etc.

We supply Steam Shovels in all sizes. Can furnish both Standard and Revolving types. Write us stating your special requirements and we will be pleased to submit proposition.

F. H. Hopkins & Co.

MONTREAL

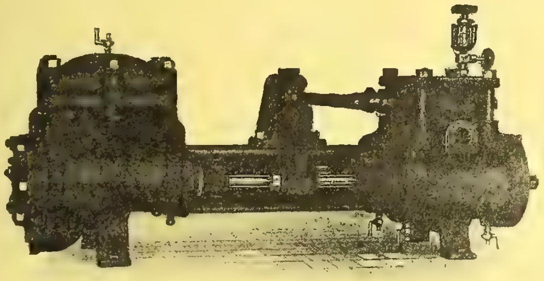
BRANCH OFFICES: **General Supply Company of Canada, Ltd., Winnipeg Agents**
Ritchie Contracting & Supply Company, Ltd., Vancouver Agents

Vol. 27 Toronto, August 13, 1913 No. 33

ESTABLISHED 1886

Contract Record and Engineering Review

Steam and Power Pumps, Condensers and Travelling Cranes



The Smart-Turner Machine Co. LIMITED
HAMILTON, CANADA

"MADE IN CANADA"

Bent Glass

Made in all Kinds of Glass on Short Notice

Large Bent Plate Glass for Shop Fronts a Specialty

The Toronto Plate Glass Importing Company, Limited
(HILL & RUTHERFORD, Managing Directors)
Head Office and Works: 91 to 133 Don Roadway
TORONTO

Air Compressors
OF BELLISS MAKE
have gained their reputation for

Simplicity of Design
Noiseless Running
Compact Design
Low Oil Consumption
Continuous Operation
Overall Efficiency

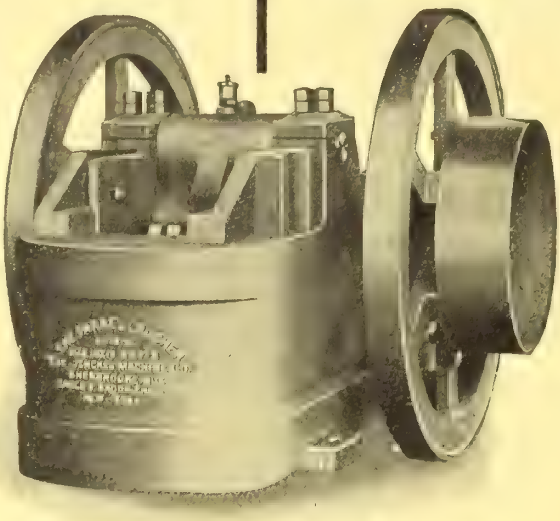
Messrs. Belliss & Morcom, Ltd.
BIRMINGHAM, ENGLAND
Agents
Laurie & Lamb
Board of Trade Building, MONTREAL

Continuous and Machine Banded Wood Stave
WATER PIPE
RESERVOIR TANKS
for city and town Water Systems, Fire Protection, Power Plants, Hydraulic Mining, Irrigation, etc. One-half the cost of Iron Pipe—and better.

Pacific Coast Pipe Co., Limited
P. O. Box 563 Vancouver, B. C.
Office and Factory, Granville St., near High Bridge
WRITE FOR CATALOGUE
Full Particulars and Estimates Furnished

Alphabetical Index of Advertisers, Page 16 Classified Directory to Advertisements, Page 6

This is a Fine Rock Crusher
The Farrel (Style B)



We build it in 20 different sizes having capacities of from 5 to 200 tons per hour for coarse or fine crushing. One of these sizes would be sure to suit your requirements.

Bulletin No. 602 gives detailed information concerning this rugged, durable jaw crusher.

Shall we send you a copy?
Ask our nearest office.

The JENCKES MACHINE COMPANY, Limited
General Offices: SHERBROOKE, QUE.
WORKS: SHERBROOKE, QUE. ST. CATHARINES, ONT.
Sales Offices: Sherbrooke, St. Catharines, Nelson, B.C., Vancouver, Montreal, Cobalt, S. Porcupine

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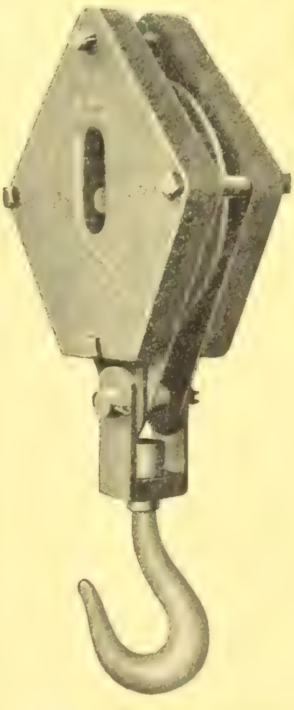


PUT THEM

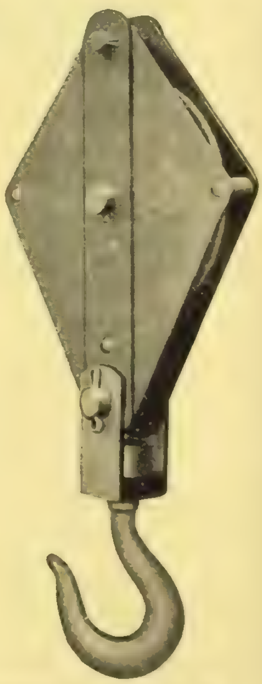
into the hardest kind of service

"AMERICAN" Wire Rope Blocks

will prove their makings and materials every time.

They will safeguard the lives of your men, your expensive material and your equipment.

They cost no more than the cheap kind but they're worth more.

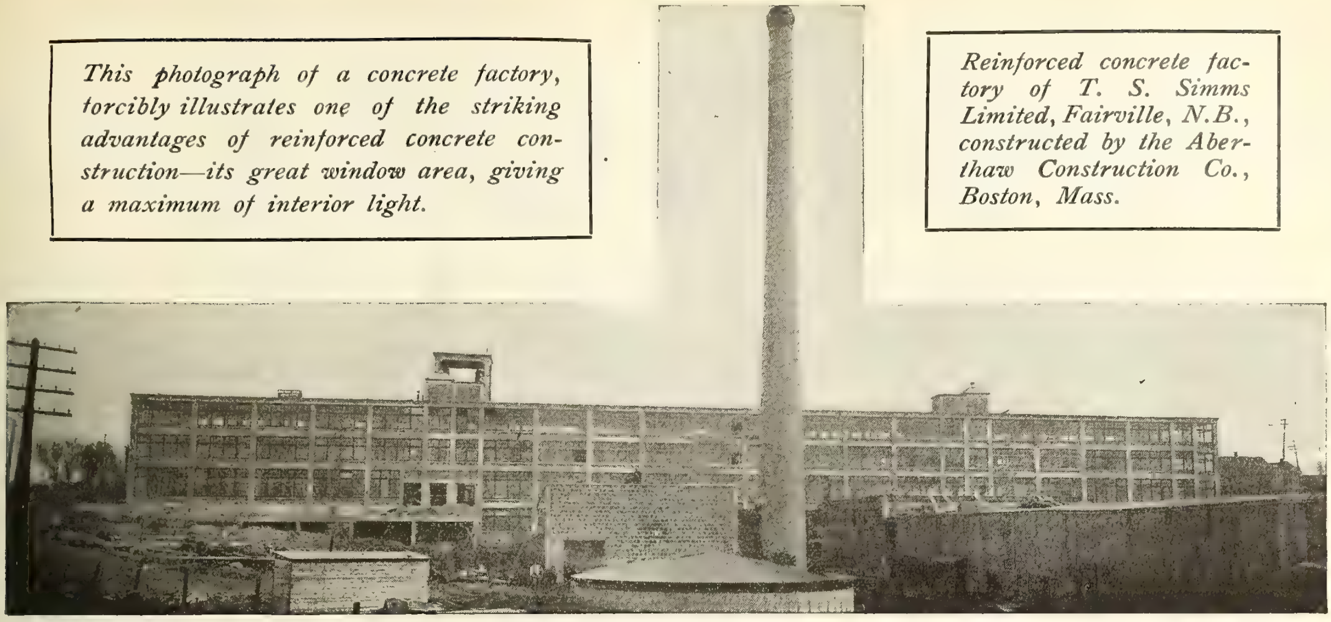


American Hoist & Derrick Company, ST. PAUL, MINN., U. S. A.

Gorman, Clancey & Grindley, Edmonton and Calgary, Alta., and Nelson, B. C.
Vancouver Machinery Depot, Ltd., Vancouver, B. C. Stuart Machinery Co., Winnipeg Can.
General Supply Co. of Canada, Ltd., Montreal, Ottawa, Toronto, Canada.

This photograph of a concrete factory, forcibly illustrates one of the striking advantages of reinforced concrete construction—its great window area, giving a maximum of interior light.

Reinforced concrete factory of T. S. Simms Limited, Fairville, N.B., constructed by the Aberthaw Construction Co., Boston, Mass.



Concrete Factories are Most Efficient

The efficiency of a machine is the ratio of the amount of work a machine does to the amount of work required to operate it. The output is equal to the input minus the work lost or wasted. The less wasted the greater the efficiency.

In the same way the efficiency of a factory may be defined as the ratio of output to input. Output financially, is increased by reducing unnecessary expenses.

Concrete Stops Wastes

Concrete buildings are proof against fire, water and vermin. They give the maximum light and are sanitary. They resist vibration, and are permanent and durable.

Fire-proofness reduces insurance rates. Water or liquids used in certain processes will not leak through floors to destroy valuable goods below. Rats and other vermin find no place to live in a concrete building, thus eliminating losses from this cause. Maximum light and sanitary conditions increase efficiency of employees. Lack of vibration reduces wear and tear on machines. Permanency and durability reduce depreciation.

The way in which concrete stops these leaks is fully described in our handsomely illustrated 224 page book, "Factories and Warehouses of Concrete." It contains photographs and data of factories and warehouses for all classes of industries.

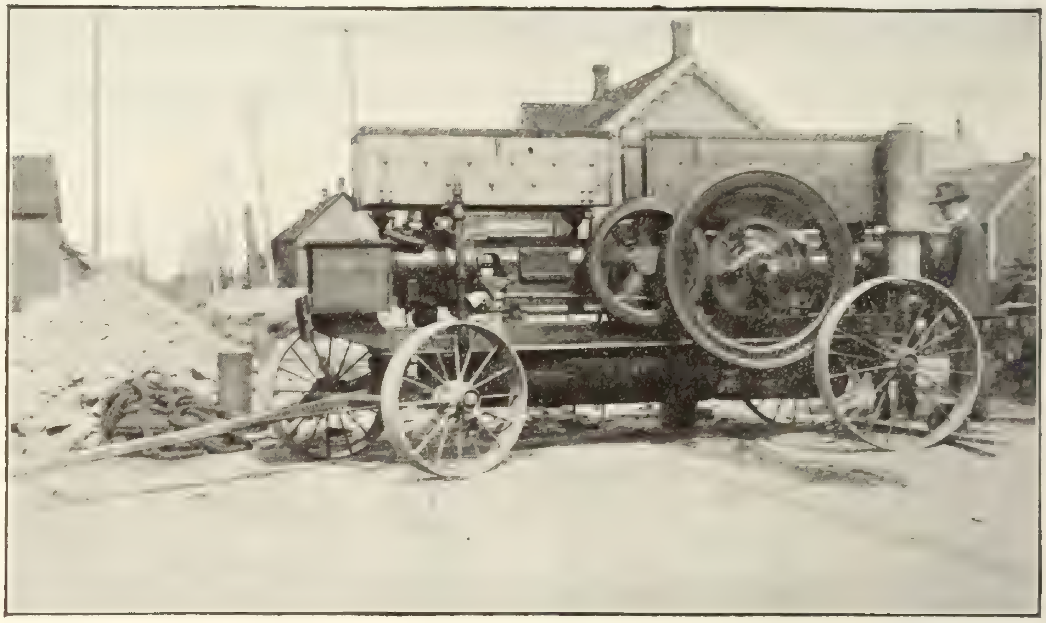
You can have a copy free if you will mention this advertisement.

Canada Cement Company
Limited
Montreal

FIGURE

Your Present Cost of Drilling. If you do not have an

ABENAQUE
PORTABLE COMPRESSOR OUTFIT



You have not found the means of getting the best value for your money.

Dozens of contractors are using Abenaque Air Compressors—are getting the best practical results and are saving dollars and cents.

Are you getting 150 to 250 feet of drilling per day at a cost of $13.00?

SEND FOR CATALOGUE

Montreal, 318 St. James St.
Toronto, 155 West Richmond St.
Cobalt, opp. Right of Way Mine.
Winnipeg, 259-261 Stanley St.

MUSSENS

DON'T BE SATISFIED

With An Inferior Article

The Best is the Cheapest in the Long Run

You Will get Greater Satisfaction and Results with a

HARDY

Than with any other Hand Hammer Drill on the market.

It is the Greatest Borer
It is the Most Economical on Air Consumption
It has the Least Repairs

Remember—It Can Do Your Particular Rock Work.

Air or Steam

FULL PARTICULARS ON REQUEST

LIMITED

Calgary, 10th Ave. & 3rd St. E.
Vancouver, 365 Water Street
Quebec, 71 Maple Ave.
St. John, N.B., 57 Smythe St.
Halifax, 78 Granville St.

CLASSIFIED INDEX TO ADVERTISEMENTS

The following regulations apply to all advertisers:—Eighth page, two headings quarter page, four headings; half page, eight headings; full page, sixteen headings.

Air Compressors
- Canadian Allis-Chalmers, Limited.
- Canadian Fairbanks-Morse Co.
- Can. Ingersoll-Rand Co., Ltd.

Architects
- Weeks, Arthur L.

Architects' Instruments
- Stanley Co., W. F.
- W. & L. E. Gurley.

Architectural Iron Work
- Canadian Allis-Chalmers, Limited.
- Canada Wire & Iron Goods Co.
- Dennis Wire & Iron Works.
- Dom. Ornamental Iron Works.
- McGregor & McIntyre
- Meadows Co. Geo. B.
- Steel & Radiation Ltd.

Architectural Metal Work
- Feather & Roadhouse.
- Ormsby Co., Limited, A. B.
- Metal Shingle & Siding Co.
- Metallic Roofing Co.

Architectural Terra Cotta
- Black Building Supply Co., Ltd.
- Don Valley Brick Works.
- Gibbs & Canning.
- Northwestern Terra-Cotta Co.
- Toronto Plate Glass Imp't'g Co.

Asphalt
- Asphalt & Supply Co.
- Baker, John Jr.
- Barber Asphalt Paving Co.
- Canadian Mineral Rubber Co.

Belting
- Can. Consolidated Rubber Co.
- Goodyear Tire & Rubber Co.
- Can. Fairbanks-Morse Co.
- Dominion Belting Co.

Blowers
- Canadian Buffalo Forge Co.
- Can. Ingersoll-Rand Co., Ltd.
- Canadian Sirocco Co.
- Douglas Milligan Co.
- Sheldons Limited
- Sturtevant Co. of Can. Ltd., B. F

Boilers
- Berg Machinery Mfg. Co.
- Canadian Allis-Chalmers, Limited.
- Boving Company of Canada.
- Inglis Co., John.
- Jenckes Machine Co.
- Leonard & Sons, E.
- Marsh & Henthorn.
- McDougall Caledonian Iron Wks.
- Mussens Limited.
- Waterous Engine Works Co.

Boxes—Junction.
- Standard Underground Cable Co. of Canada Limited.

Brewers' Machinery
- Linde British Refrigeration Co.

Brick
- American Enamelled Brick Co.
- Black Building Supply Co., Ltd.
- Bradford Pressed Brick Co.
- Douglas Milligan Co.
- Don Valley Brick Works.
- Hamilton Pressed Brick Works.
- North-Western Terra Cotta Co.
- Nova Scotia Clay Works.
- Sydney Pressed Brick Co.

Brick Chimneys
- Douglas Milligan Ltd.
- Heinicke Co., H. R.

Brick Machinery and Supplies
- Bechtels Limited
- Berg Machinery Mfg. Co.
- Sheldons Limited

Brick Dryers
- Bechtels Limited.
- Berg Machinery Mfg. Co.
- Canadian Buffalo Forge Co.

Bridges (Steel)
- Canadian Allis-Chalmers, Limited.
- Canadian Bridge Co.
- Chicago Bridge & Iron Works.
- Des Moines Bridge and Iron Co.
- Dickson Bridge Works.
- Dominion Bridge Co.
- Hamilton Bridge Works Co.
- Mackinnon-Holmes & Co.
- McNeil & Co., W. P.
- National Bridge Co.
- Phoenix Bridge & Iron Works.
- Sarnia Bridge Co.
- Scherzer Rolling Lift Bridge Co.
- Structural Steel Co.
- Standard Steel Construction Co.

Buckets
- American Hoist & Derrick Co.
- Browning Engineering Co.
- Canadian Fairbanks-Morse Co.
- Lecky & Collis.
- Thew Shovel Company.

Cable
- Canada Wire & Cable Co.
- Imperial Wire & Cable Co.
- Standard Underground Cable Co. of Canada, Limited.

Cement
- Alsen Portland Cement Co.
- Britnell & Co.
- Bremner, Alex.
- Canada Cement Co.
- McNally & Co., W.
- Morrison & Co., T. A.
- Ontario Lime Co., Ltd.
- Rogers, Alfred Limited
- Smyth & Ryan.

Cement Tools
- Abram Cement Tool Co.
- Wettlaufer Bros.

Coal Chutes
- Galt Stove & Furnace Co.

Coal Handling Apparatus
- American Hoist & Derrick Co.
- Browning Engineering Co.
- Brown Hoisting Machinery Co.

Combination Woodworkers
- Hutchinson, M.

Concrete Mixers and Appliance ..
- Blystone Machinery Co.
- Canadian Allis-Chalmers, Limited.
- Canadian Concrete Appliance Co.
- Hopkins & Co., F. H.
- Lecky & Collis.
- London Concrete Machinery Co.
- Mussens Limited.
- Waterloo Cement Machinery Co.
- Wettlaufer Bros.
- Woodstock Wind-Motor Co.

Conduits
- Can. H. W. Johns-Manville Co.
- Conduits Co., Limited.

Contractors
- Eastern Pipe Construction Co.
- Foundation Co.
- Reggin & Spence.

Contractors' Plant and Supplies
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- Barber Asphalt Paving Co.
- Bateman Wilkinson Co.
- Beatty & Sons, M.
- Browning Engineering Co.
- Canadian Allis-Chalmers, Limited.
- Canadian Fairbanks-Morse Co.
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- Doty Marine Engine & Boiler Co.
- Dore & Fils.
- Hamilton Mfg. Co., Wm.
- Hepburn & Co., F. H.
- Hopkins & Co., F. H.
- International Marine Signal Co.
- Lecky & Collis.
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- Montreal Locomotive Works.
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- Schell Foundry & Machine Co.
- Stinson-Reeb Builders' Supply Co
- Woodstock Wind-Motor Co.
- Wettlaufer Bros.

Conveying Machinery
- Weller Mfg. Company.

Core Drills
- Can. Ingersoll-Rand Co., Ltd.

Cork Installation Machinery
- Linde British Refrigeration Co.

Corrugated Iron
- Can. H. W. Johns-Manville Co.
- Metallic Roofing Co.
- **Ormsby, A. B., Limited.**

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- Browning Engineering Co.
- Brown Hoisting Machinery Co.
- International Marine Signal Co.
- Royce Limited.

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- Cabot, Inc., Samuel.

Crushed Stone and Granite
- Ontario Lime Co., Ltd.
- Rogers Supply Co.
- Sand and Supplies Limited.
- Smyth & Ryan.

Crushers (Stone and Rock)
- Canadian Allis-Chalmers, Limited.
- Hamilton Mfg. Co., Wm.
- Hopkins & Co., F. H.
- Jenckes Machine Co.
- Lecky & Collis
- London Concrete Machinery Co.
- Mussens Limited.
- Wettlaufer Bros.

Derricks and Derrick Fittings
- American Hoist & Derrick Co.
- Hepburn, John T.

Dredges
- Beatty & Sons, M.
- Browning Engineering Co.

Drills
- Beatty & Sons, M.
- Canadian Allis-Chalmers, Limited.
- Canadian Buffalo Forge Co.
- Canadian Ingersoll-Rand Co.
- Lecky & Collis.
- Star Expansion Bolt Co.

Drill Steel Sharpeners
- Canadian Ingersoll-Rand Co.

Dump Cars, Wheels, etc.
- Bechtels Limited.
- Schell Foundry & Machine Co.
- Western Wheeled Scraper Co.

Electric Air Rock Drills
- Canadian Ingersoll-Rand Co.

Electrical Machinery and Supplies
- Engineering Works of Canada.
- Ferranti Electrical Co.

Engines
- Boving Company of Canada.
- Canadian Buffalo Forge Co.
- Inglis Co. John.
- Jenckes Machine Co.
- Laurie & Lamb.
- Leonard & Sons, E.
- McDougall Caledonian Iron Wks.
- Mussens Limited.
- Sturtevant Co. of Can. Ltd., B. F
- Waterous Engine Works Co.
- Wettlaufer Bros.

Engineers (Civil and Mechanical)
- Bowman & Connor.
- Campbell, R.
- Chipman & Power.
- Farmer, John T.
- Galt Engineering Co., John
- Lea & Ferguson.
- Mitchell, C. H.
- Thorold Co., F. W.

Expansion Bolts
- Star Expansion Bolt Co.

Expanded Metal
- Mannesmann Tube Co

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- Canadian Buffalo Forge Co.
- Sheldons Limited.
- Sturtevant Co. of Can. Ltd. B. F.

Field Instruments
- Gurley, W. & L. E.

Filler, Floor and Sewer Joint Asphalt
- Canadian Mineral Rubber Co.

Filters
- American Water Softener Co.

Fire Brick
- Improved Equipment Co.
- Ontario Lime Co., **Ltd.**
- Smyth & Ryan.

Fire Escapes
- McGregor & McIntyre

Fireproof Doors and Windows
- Feather & Roadhouse.
- Metal Shingle & Siding Co.
- Mussens Limited.
- Ormsby Co., Limited, A. B.
- Steel & Radiation Ltd.

Fixtures (Gas)
- Consumers Gas Co.

Fuse (Safety Blasting)
- Lecky & Collis.

Forges
- Canadian Buffalo Forge Co.
- Sheldons Limited.
- Canadian Sirocco Co.

Furnaces (Special)
- Improved Equipment Co.

Gasoline Engines
- Wettlaufer Bros.

Gas Plants Complete
- Improved Equipment Co.

Gas Producers for Heating
- Improved Equipment Co.

Gas Machinery
- Improved Equipment Co.

Glass
- Consolidated Glass Co.
- Hobbs Mfg. Co.
- Luxfer Prism Co.
- Toronto Plate Glass Imp't'g. Co

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- Canadian Ingersoll-Rand Co.

Heating Apparatus
- Canadian Buffalo Forge Co.
- Canadian Sirocco Co.
- Sheldons Limited

High Pressure Pipe Lines
- Boving Company of Canada.
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- Pittsburgh Valve, Foundry & Con struction Company.

Hoisting Apparatus
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- Browning Engineering Co.
- Canadian Allis-Chalmers, Limited.
- C. H. & E. Mfg. Co.
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- Doty Marine Engine & Boiler Co
- Jenckes Machine Co.
- Hopkins & Co., F. H.
- Lecky & Collis.
- Marsh & Henthorn.
- Mussens Limited.
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Hoisting Engines
- Canadian Allis-Chalmers, Limited.
- Canadian Fairbanks-Morse Co.
- Wettlaufer Bros.

Hydrants
- Canada Iron Corporation.
- Gartshore-Thomson Pipe Co.
- Kerr Engine Co.

(Continued on page 12)

Canadian Bank of Commerce, College and Dovercourt, Toronto

Don Valley Uniformity

THE uniformity of size and shade and the unvarying good quality of Don Valley Clay Products has made them the popular material for every class of building.

For bank buildings the architectural possibilities of Don Valley Bricks are almost without number. Some pleasing and permanent effects may be obtained by arranging the bricks in patterns or panels.

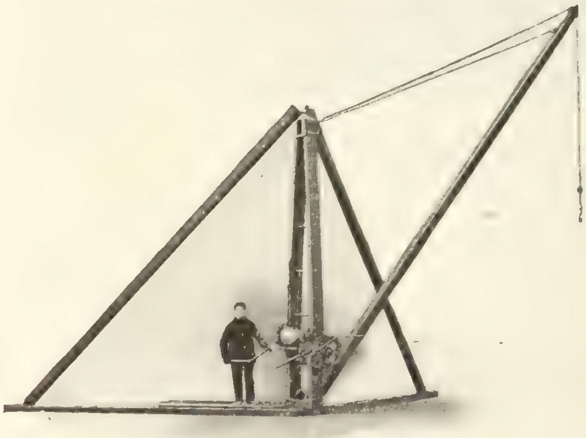
Don Valley Clay Products are specified for Canada's finest buildings.

Use the Best
Don Valley

Don Valley
Brick Works
Toronto
Ontario

Beath Scotch Derricks

Hand or Power



THE construction of Beath Scotch Derricks embodies several points of merit not found in other makes.

All stress parts are **steel** not cast iron. Bottom Pintle Bearing is of ball and socket type and works in a bath of oil, thus ensuring an easy movement at this joint.

Beath Derricks are provided with self-oiling bearings, ensuring easy operation and reducing wear to a minimum.

We also make Jinniwink Derricks, Stiff Leg Derricks, Guy Derricks, and Steel Derricks for heavy service. Hand or Power operated.

Send us your enquiries for Derricks

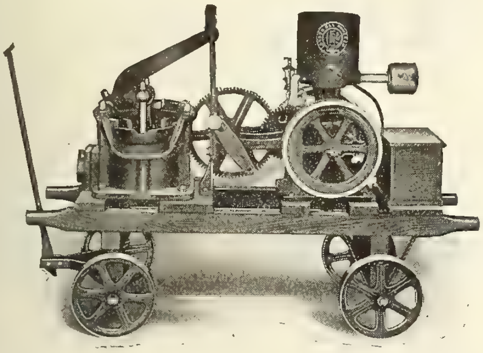
W. D. Beath & Son, Limited

ENGINEERS AND MANUFACTURERS

20-30 Cooper Ave., Toronto

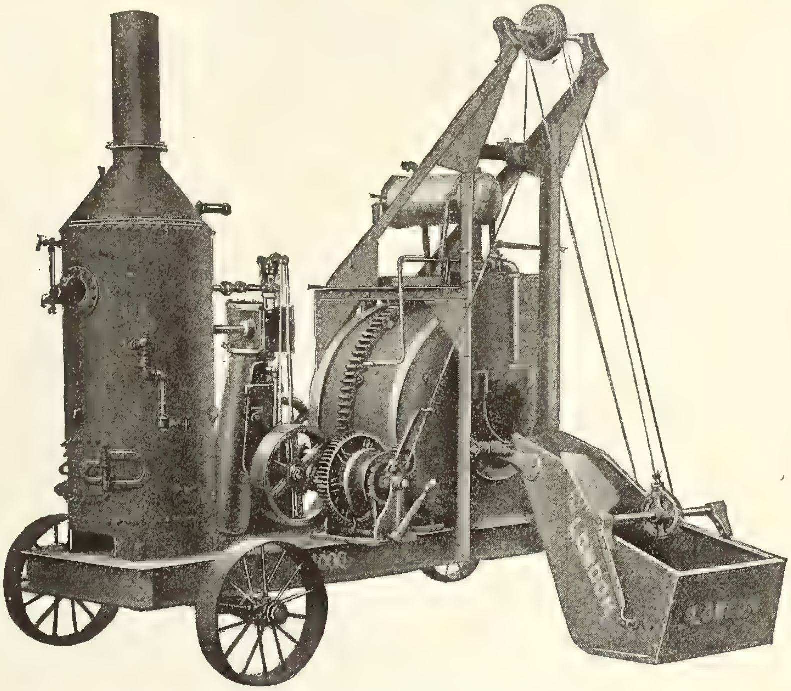
Before You Buy Concrete Machinery

or Equipment of any kind, write us for our 180 page catalogue.



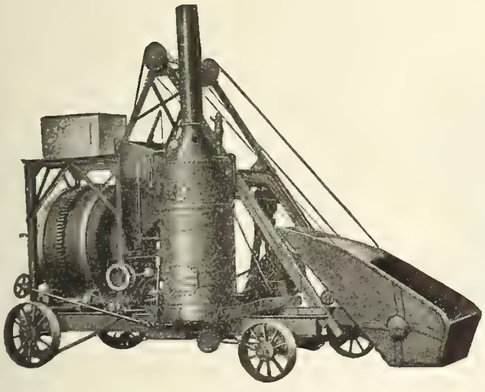
Power Diaphram Pump

We are the largest manufacturers of Concrete Machinery in Canada.



London Standard Drum Batch Mixer

This machine is built in five sizes, fitted with any kind of power ; also with traction drive if required.



Rear Discharge Traction Mixer. This machine is also equipped with Boom.

We do not build machinery down to a price but up to a standard.

London Sill Step and Window Cap Mould

A few lines we manufacture—

Concrete Mixers, Mortar Mixers, Tile Moulds, Drain Tile Machines, Side Walk Tile Machines Cement Block Machines, Cement Brick Machines, Sill Step and Window Cap Moulds, Gasoline Engines, Screens and Elevators Fence Post Moulds, Hoisting Engines, Material Elevators, Concrete Carts, Wheelbarrows, Scrapers, Sidewalk Forms Pumping Outfits

A complete line of Contractors' Tools.

London Concrete Machinery Co., Limited

Head Office and Factory: Cabell St. and Kitchener Ave., London, Ont.

BRANCHES:

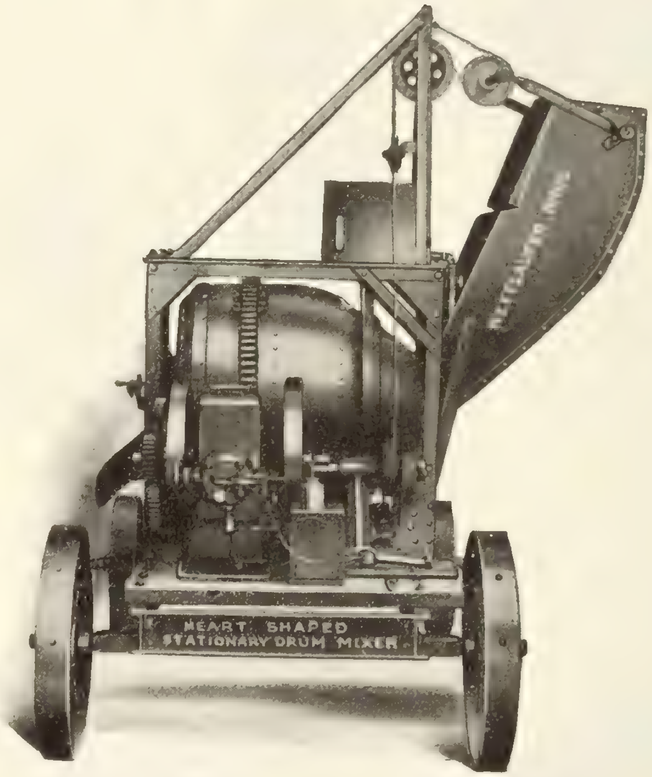
WINNIPEG (445 Main St.) W. H. Rosevear, Mgr.
CALGARY (622 9th Ave. W.) P. D. McLaren, Mgr.
TORONTO (60 Richmond St. E.) F. D. Emsley, Mgr.

AGENCIES:

VANCOUVER, B. C. Equipment Co.
MOOSE JAW, Sask. Bridge & Iron Co., Ltd.
REGINA, H. A. Knight
FORT WILLIAM, Northern Eng. & Supply Co.
MONTREAL, Foss & Hill Mach. Co.
QUEBEC, A. D. Masson

We are the Largest Manufacturers of Concrete Machinery in Canada.

Wettlaufer Stationary Heartshape Mixer



Showing discharge side of Stationary Heart-shape Mixer.
The batch is instantly discharged by simply
turning the handle.

This stationary drum mixer is the latest addition to the Wettlaufer line.

The drum is heart shape and also provided with mixing fans thus insuring thoroughly mixed concrete.

The automatic loading hopper is simple, clean and quick, it is easily filled and empties clean.

There is a Wettlaufer Mixer for every requirement of the smallest contractor or the largest construction company.

Attend a daily demonstration at any of our branches.

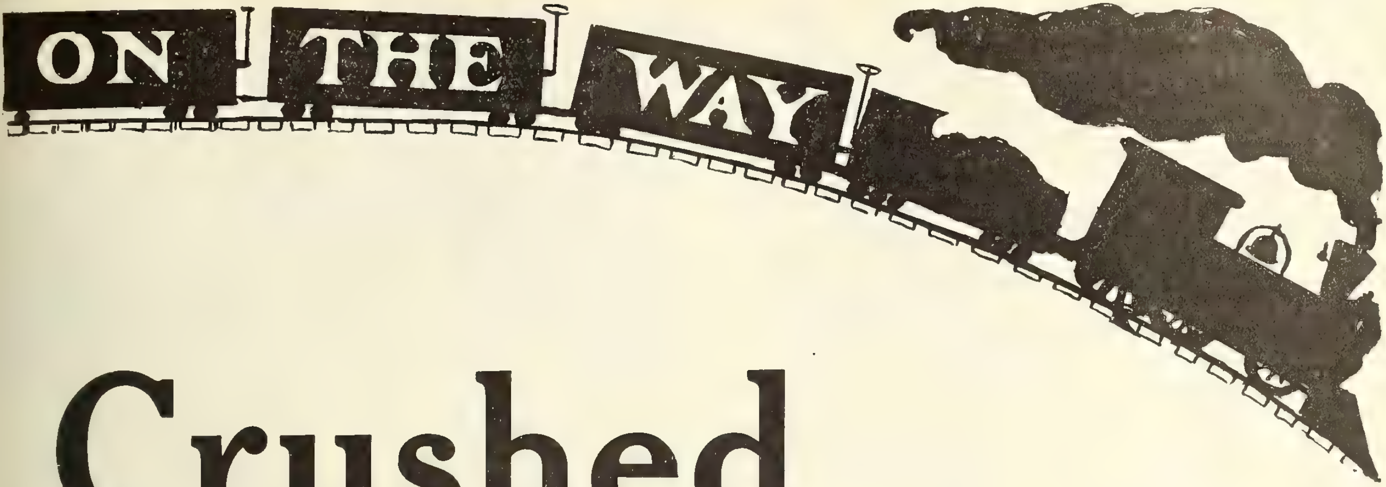
Wettlaufer Bros.

178 Spadina Ave., Toronto, Ont.

Factories: Mitchell, Ont., Buffalo, N. Y., Detroit, Mich.

AGENCIES:

A.E. Hodgert, Regina. Sask. Maysmith & Lowe, 1057 Mears St., Victoria, B.C. A.R. Williams Machinery Co., 15 Dock St., St. John, N.B. The Canadian British Engineering Co., Ltd., 324 Smith St., Winnipeg, Man. R.F. Mancill, 117 10 Ave. East, Calgary. The Hallman Machinery Co., 374 Alexander St., Vancouver, B.C. J. L. Lachance, Ltd., 363 St. Paul St.. Quebec. Wettlaufer Bros. 316 Lagauchetiere St. W., Montreal



Crushed Stone

If you want crushed stone in a big hurry come to us and you will get it.

Our bins are always loaded to the top with stone of all grades and shipments can be made the day your order is received.

Quarries located at Dundas and Vinemount.

Portland Cement

Our several cement mills are located at various points that enable us to make prompt shipments with short hauls.

Send us your next order.

Alfred Rogers

Limited

28 King St. West, Toronto

CLASSIFIED INDEX TO ADVERTISEMENTS—CONTINUED

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Linde British Refrigeration Co.

Insulating Compounds
Standard Underground Cable Co. of Canada, Limited.

Interior Finish and Doors
Batts Limited
Canada Office & School Fur. Co.
Rhodes Curry & Co.

Kilns
Canadian Buffalo Forge Co.
Sheldons Limited.
Sturtevant Co. of Can. Ltd., B. F.
Canadian Sirocco Co.
Berg Machinery Mfg. Co.

Lime
Jamieson Lime Co.
Ontario Lime Co., Ltd.

Lime Kilns
Improved Equipment Co.

Locomotives
Buffalo Pitts Co.
Boving Company of Canada.,
Canadian Allis-Chalmers, Limited.
Montreal Locomotive Works
F. H. Hopkins Co.
Mussens Limited.

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Dominion Marble Co.
Missisquoi-Lautz Corporation

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Greening Wire Co., B.
Metallic Roofing Co.
Noble, C. W.
Steel & Radiation Ltd.

Meters, Electrical
Ferranti Electrical Mfg. Co.
Canadian Allis-Chalmers.

Meters, Water
Hopkins & Co., F. H.
McDougal Caledonian Iron Wks
Neptune Meter Co.

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Hotchkiss Lock Metal Form Co

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Dominion Paint Works.
Goheen Mfg. Co.
Ottawa Paint Co.

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Dominion Paint Works.
Goheen Mfg. Co.
Pinchin, Johnson & Co.

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Asphalt & Supply Co.
Barber Asphalt Paving Co.
Dominion Creosoting Company.
Ontario Asphalt Block Co.
Paterson Mfg. Co., B.

Perforated Metals
Canada Wire & Iron Goods Co.
Greening Wire Co., B.

Pipe (Concrete, Iron and Wood)
American Spiral Pipe Works.
Canadian Allis-Chalmers, Limited.
Canadian Pipe Co.
Dominion Concrete Co.
Dominion Wood Pipe Co.
Gartshore-Thomson Pipe Co.
Munderloh & Co.
National Iron Works.
National Pipe & Foundry Co.
Pacific Coast Pipe Co.
Piggott & Co., Thos.
United States Cast Iron Pipe & Foundry Company.
Walsh Plate & Structural Works

Pile Driving Machinery
American Hoist & Derrick Co.
Browning Engineering Co.
Canadian Ingersoll-Rand Co.
Lecky & Collis.

Pipe Fittings and Flanges
Pittsburgh Valve, Foundry & Construction Company.

Planing Mill Exhausters
Canadian Buffalo Forge Co.
Sheldons Limited.
Canadian Sirocco Co.

Plug Drillers
Canadian Ingersoll-Rand Co.

Plaster
Albert Mfg. Company.
Britnell & Company.
Crown Gypsum Company.
Ontario Lime Co., Ltd.

Pneumatic Machinery
Canadian Ingersoll-Rand Co.

Portable Saws
C. H. & E. Mfg. Co.
Canadian Fairbanks-Morse Co.

Portable Track
Bechtels Limited

Power Engines
Inglis Company, John.
Jenckes Machine Company.
Canadian Allis-Chalmers, Limited.
Waterous Engine Works.

Pumps and Pumping Machinery
Beatty & Sons, M.
Boving Company of Canada.
Canadian Allis-Chalmers, Limited.
Canadian Buffalo Forge Co.
Canadian Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co.
Cook, A. D.
Hamilton Mfg. Co., Wm.
Hopkins & Co., F. H.
Inglis & Co., John.
McDougall Caledonian Iron Wks.
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(Continued on page 14)

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Reduced Loss
Increased Profit

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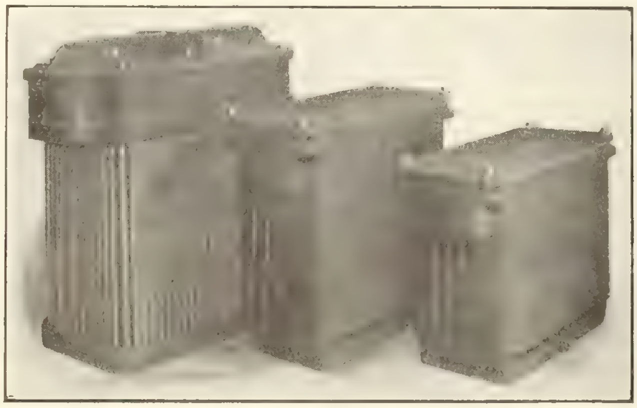
Transformers



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All coils are wound with copper of ample sectional area, thereby reducing copper losses to a minimum.

Three phase transformers are the most economical type to operate and will effect a considerable saving in construction cost.

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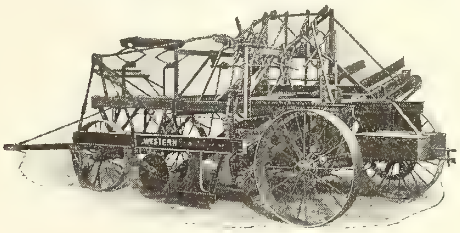

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The Toughest Stone for Macadam in Ontario

Record of Logan Avenue, Toronto, Macadamized from Queen St. to Gerrard St., in 1902
Length 2,454 Lin. Ft. Width 24 Lin. Ft. 6,550 Sq. Yds.

COST FOR REPAIRS

1903	$ 0.00	1908	$ 93.26
1904	3.30	1909	200.46
1905	9.35	1910	14.07
1906	37.33	1911	2.29
1907	16.11		

Total $376.17 or 5⅔c. per sq. yd. for repairs for nine years, a little over 6-10 of 1c. per sq. yd. per year.

Why Not Use Hagersville Stone and Get These Results?

Hagersville Contracting Co.
Hagersville, Ont. **Limited**

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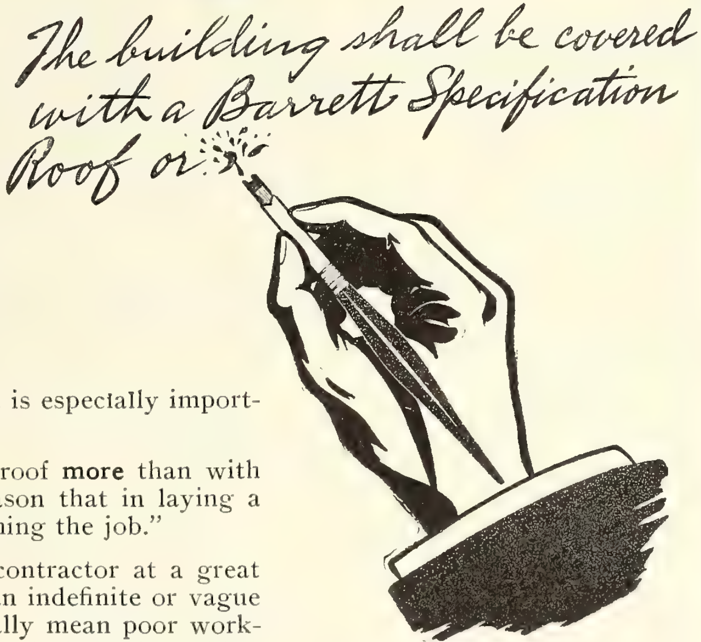
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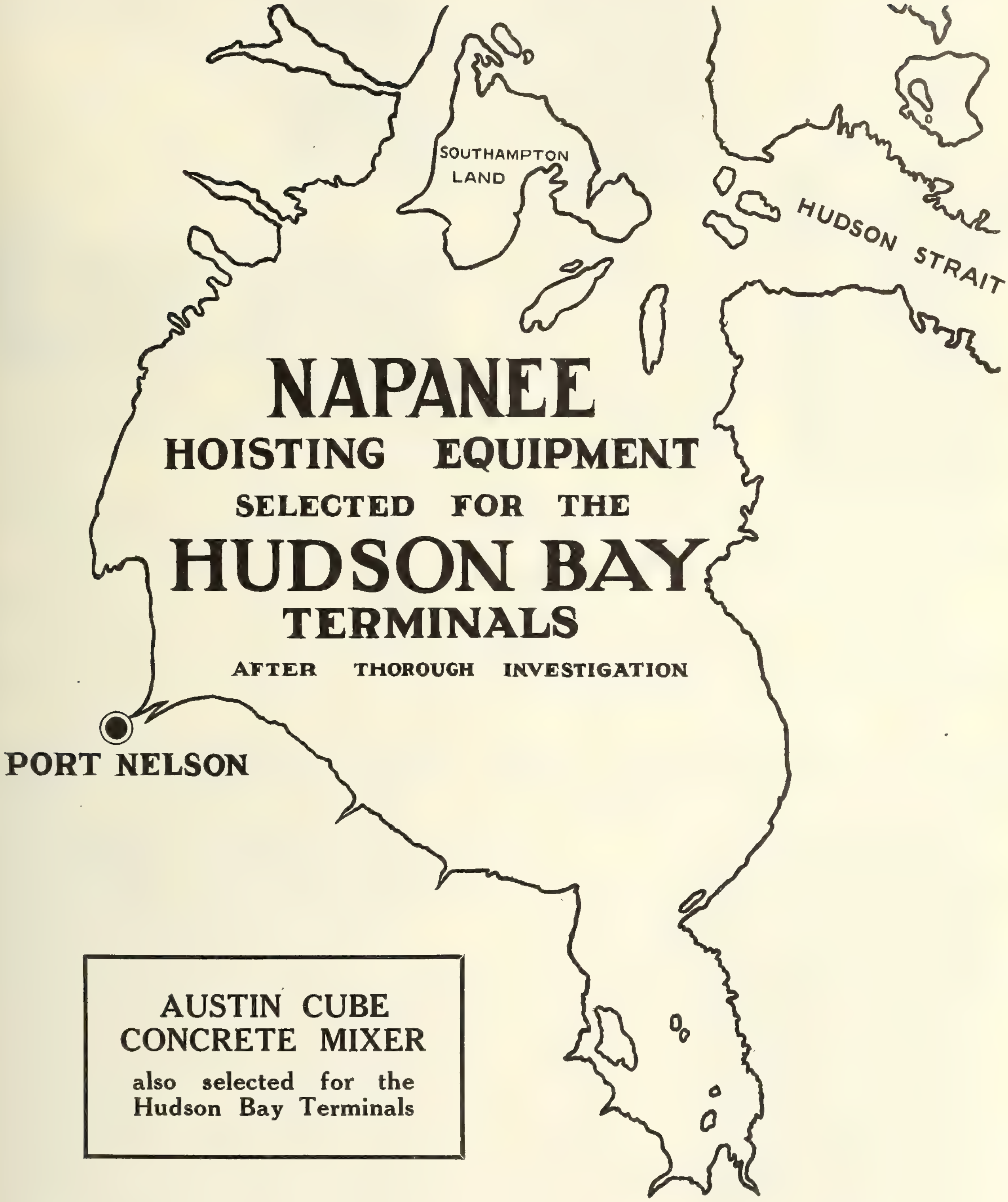

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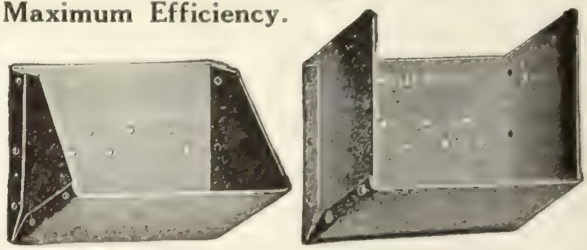

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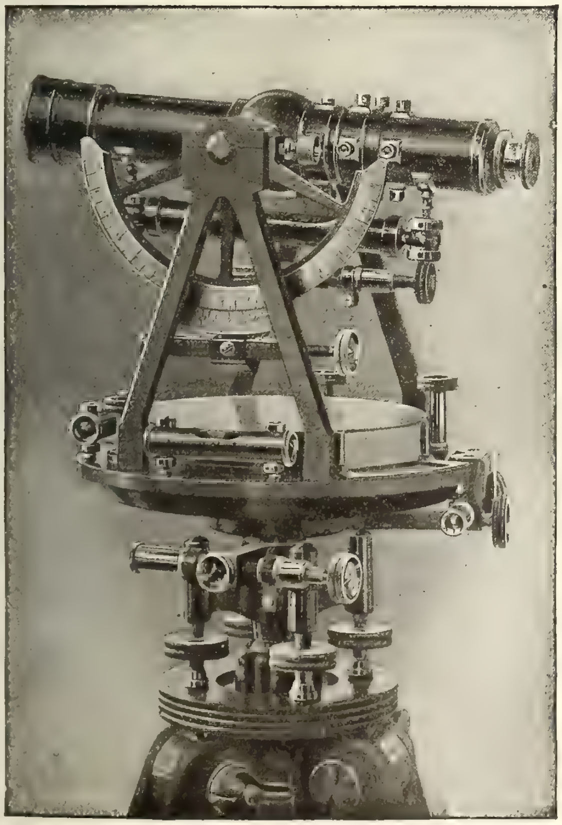

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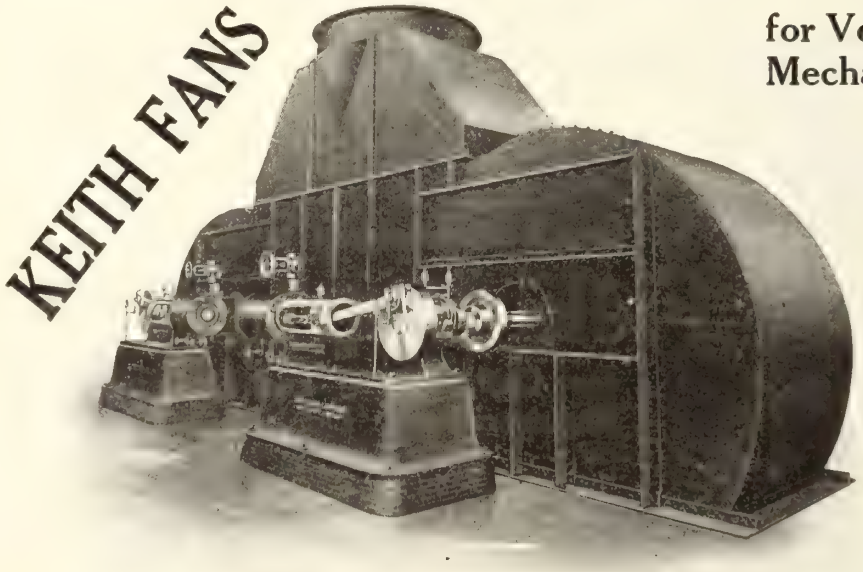

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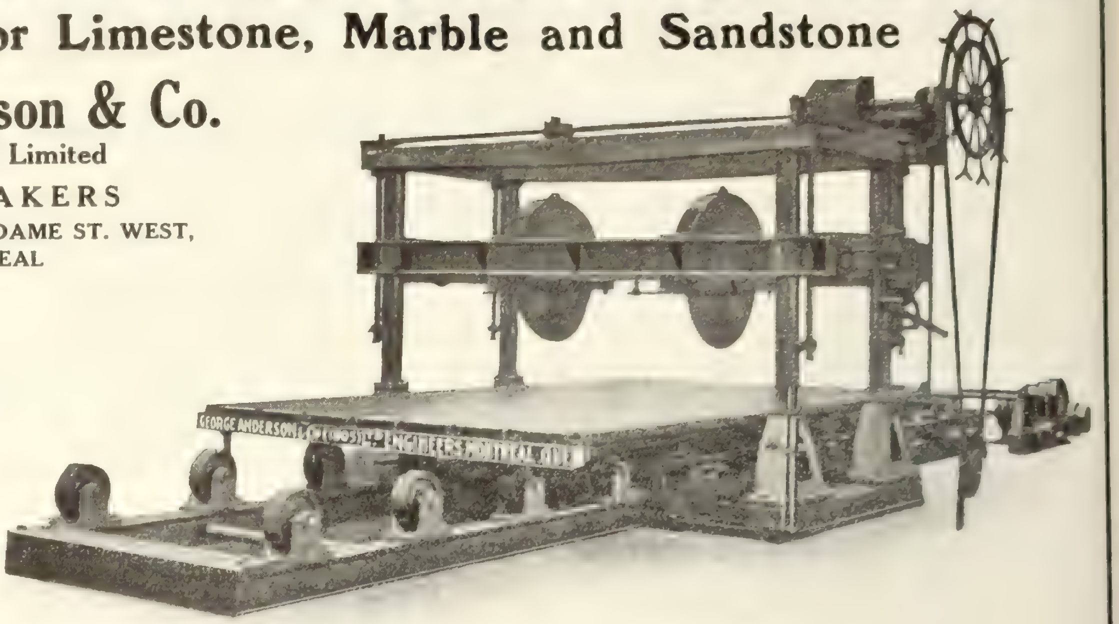

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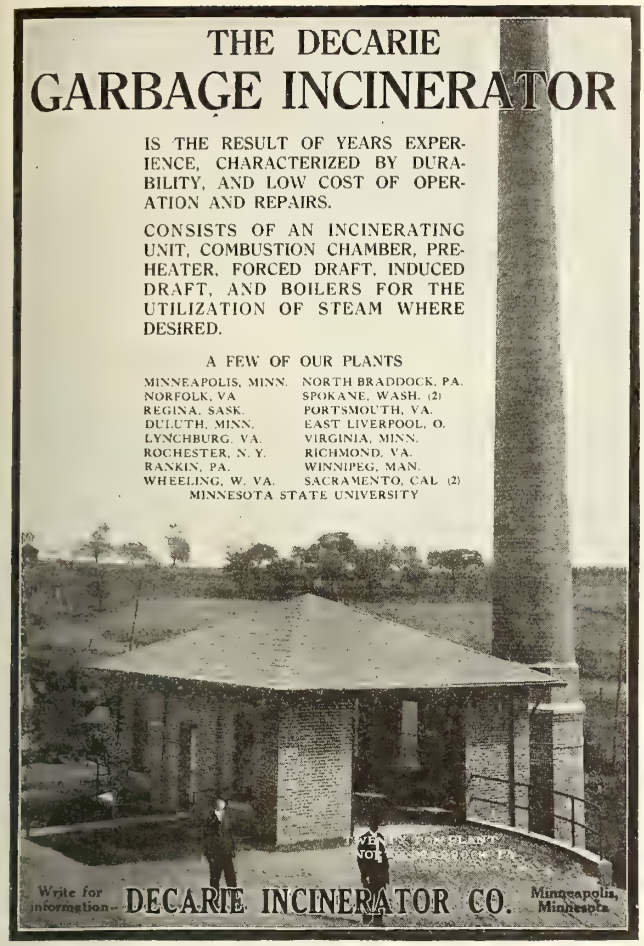

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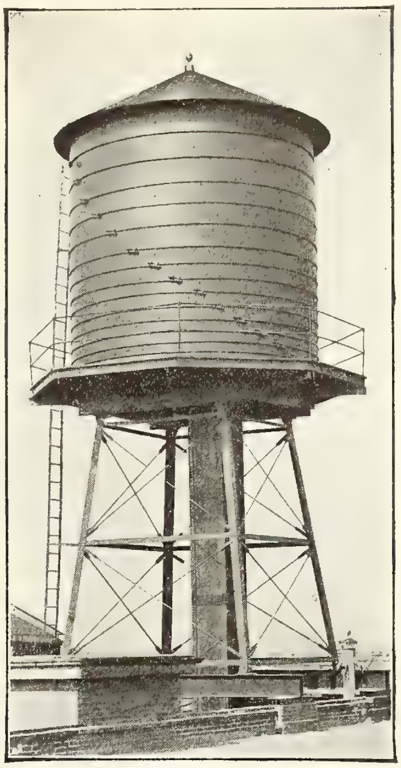

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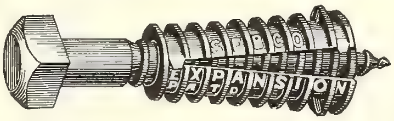

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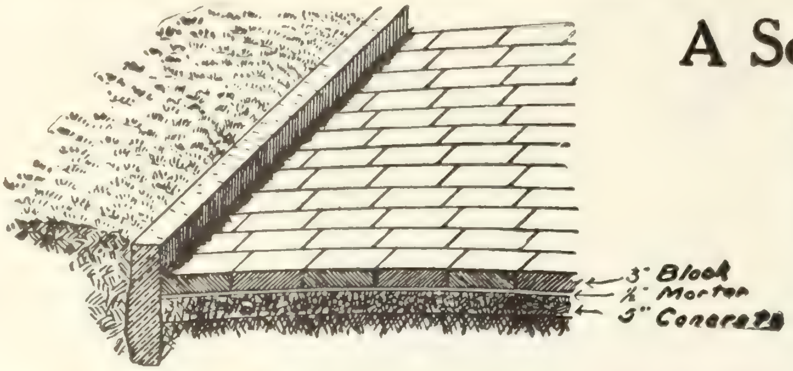

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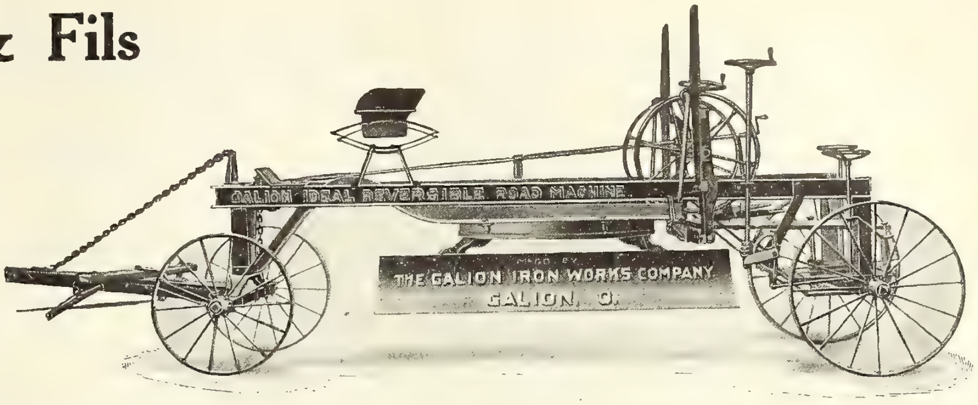
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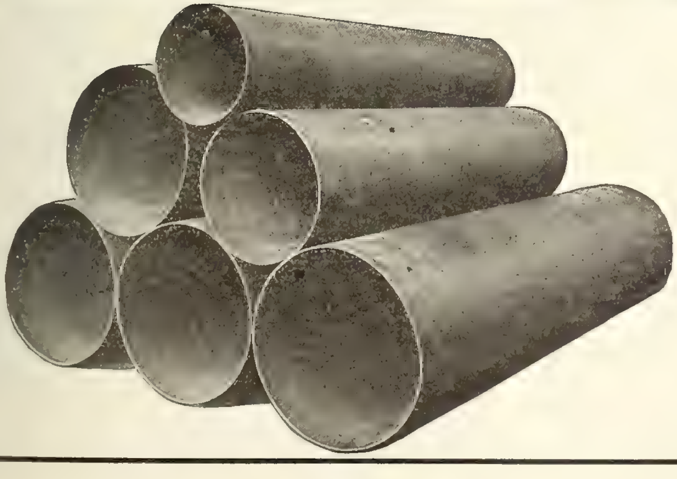

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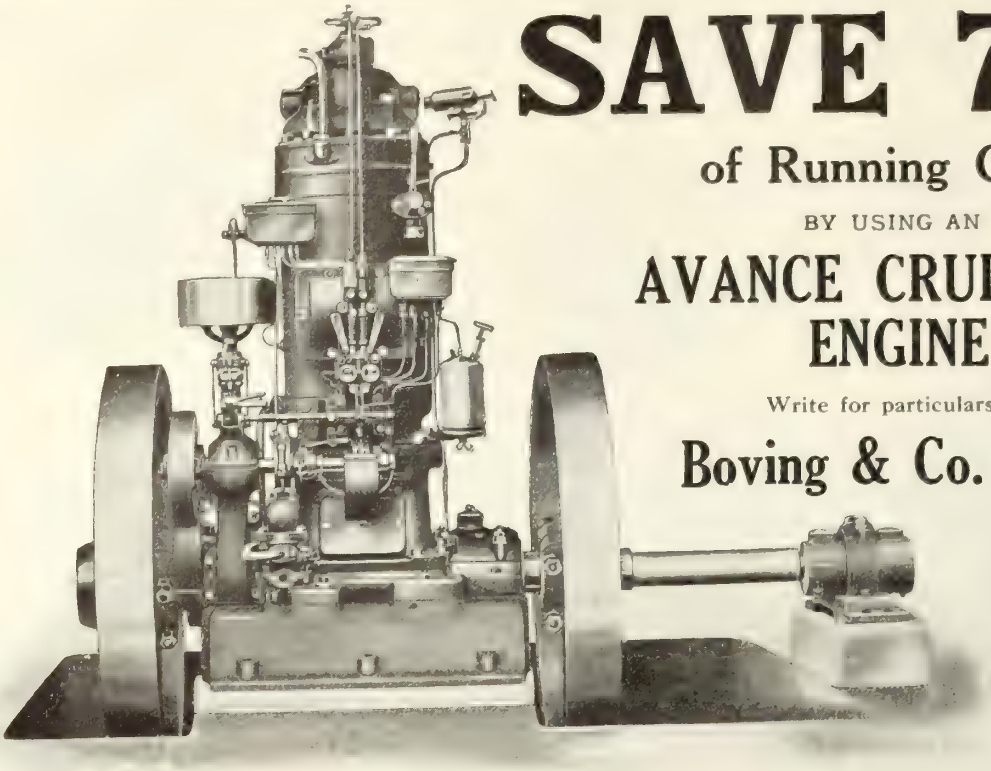

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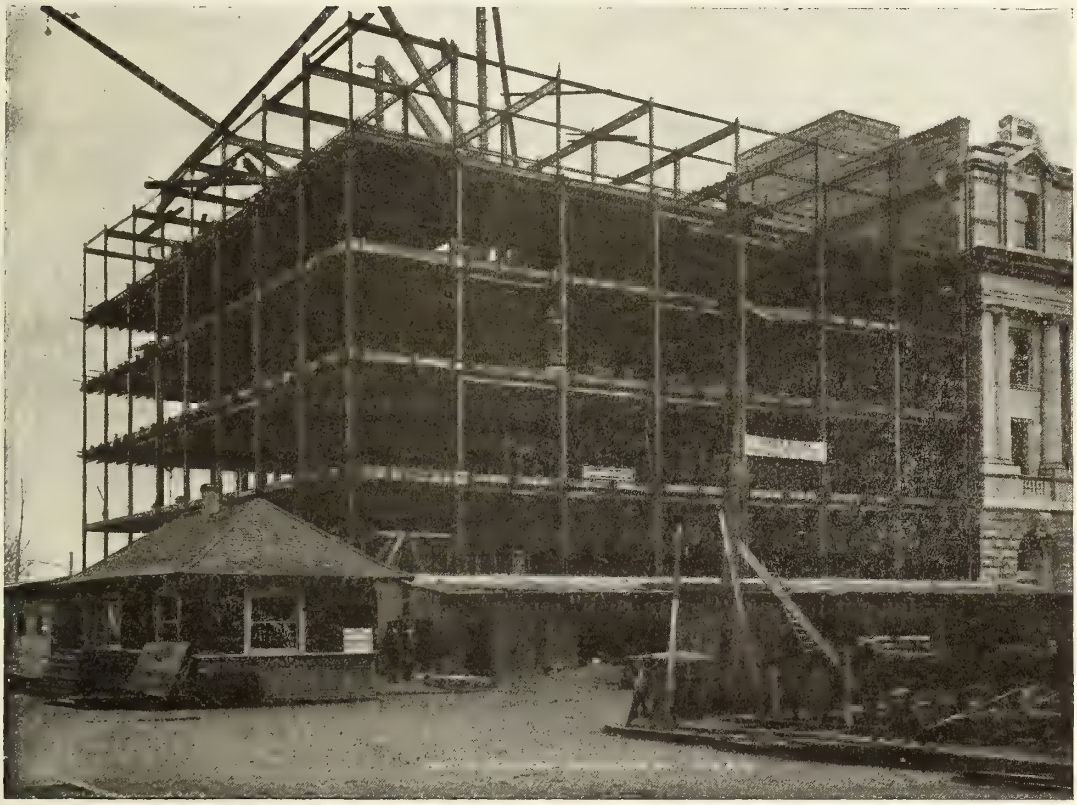

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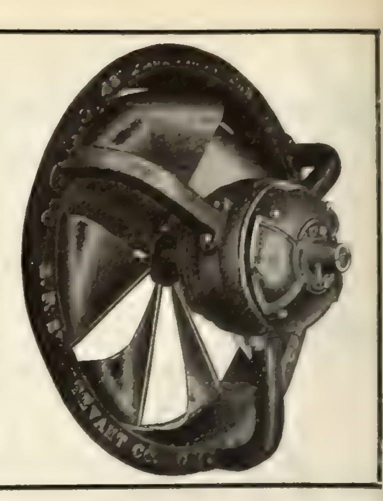

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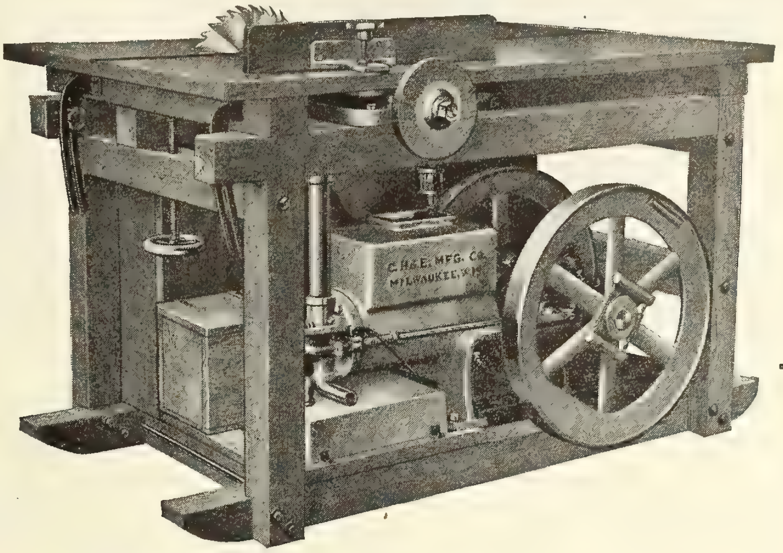

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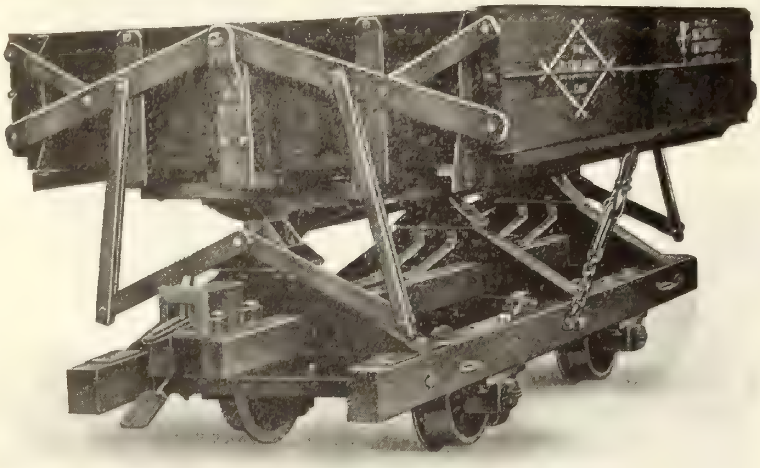

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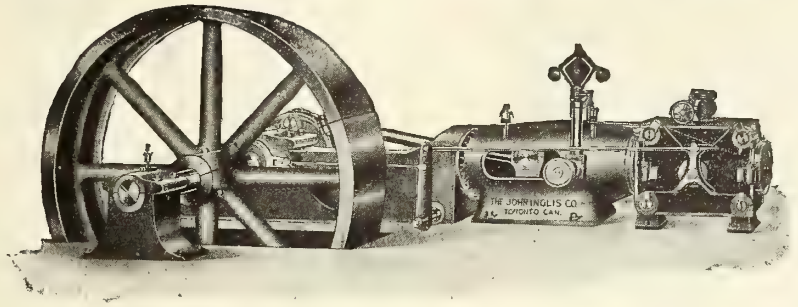
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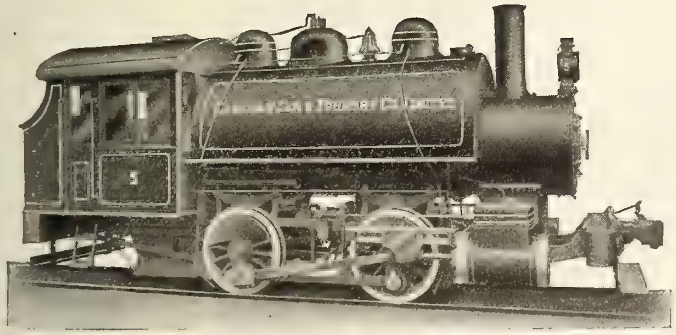

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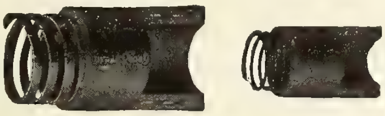

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The smooth bore hose is reinforced by a galvanized iron coil entirely imbedded in the wall of the hose. Water or other liquids cannot reach it. The inner wall is smooth. This lessens the friction resistance to the flow and saves power.

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This is the GOODYEAR "UNDERWRITERS" FIRE HOSE

Each 50 foot length is tested to 200 pounds pressure and branded to that effect. The inner tube is of the highest grade NEW rubber, of uniform thickness and quality. It will give long service without hardening or cracking. The fabric is made rot and mildew proof by antiseptic treatment.

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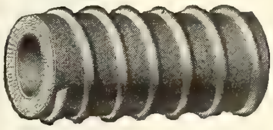

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This hose is highly esteemed by practical men. Goodyear Steam Hose is made for extra hard service. It is lined with a special heat and oil resisting seamless tube

Goodyear Steam Hose is a reliable hose under high pressures of steam or hot water. Don't take chances by using inferior hose for steam. Have Goodyear—it is made for high pressure from carefully tested materials. The inner lining is of a special rubber composition which resists the action of heat. It keeps the extreme heat from the frictioned fabric. This is what makes Goodyear Steam Hose durable.

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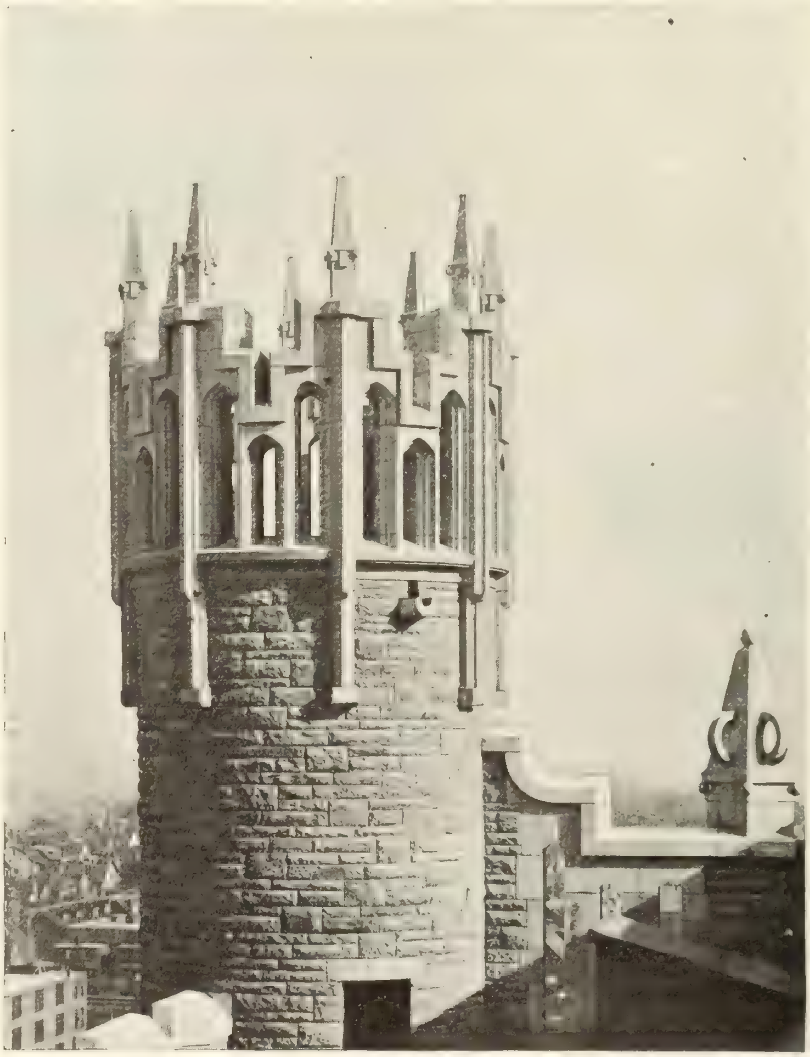

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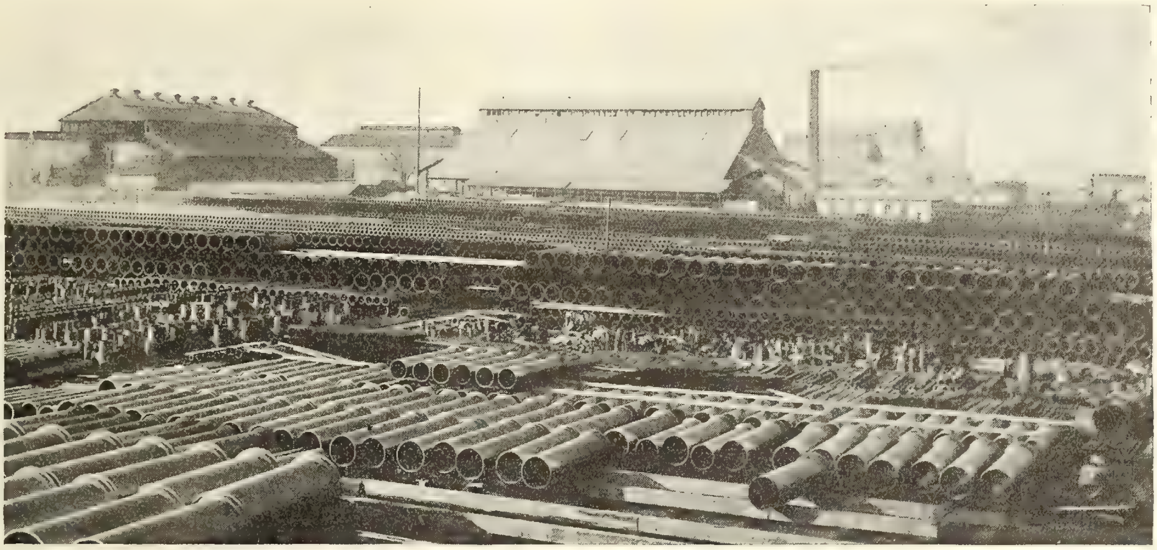

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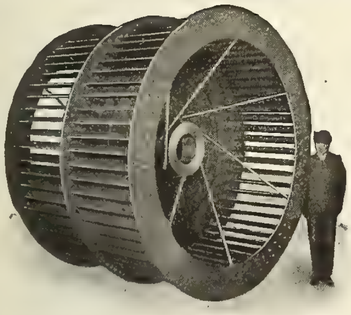

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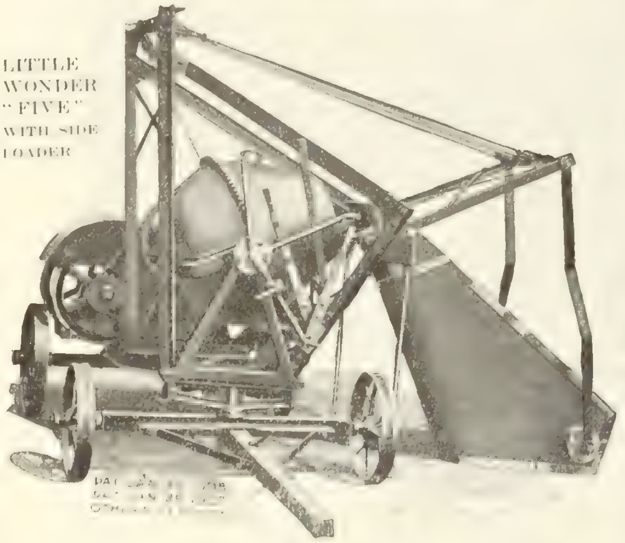

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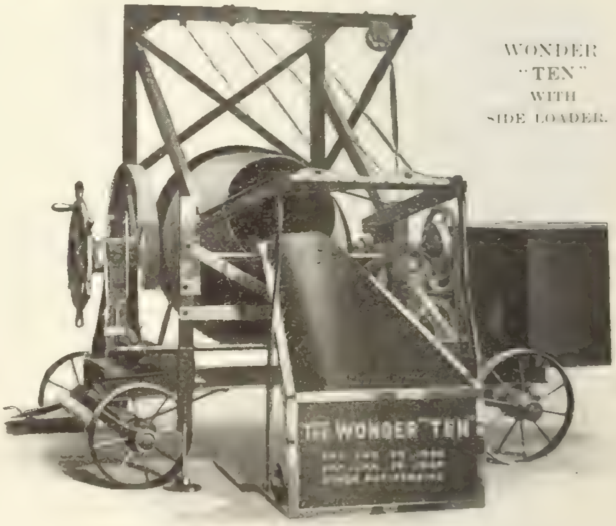

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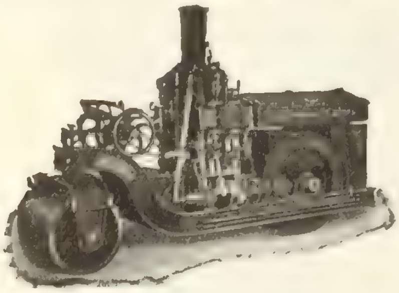

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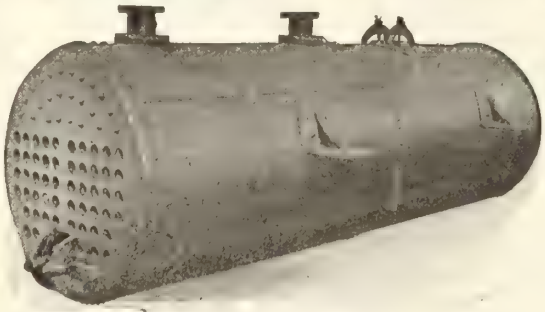

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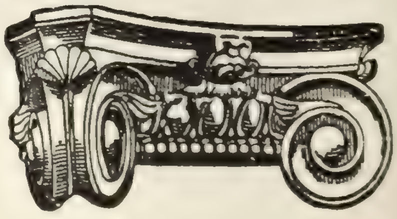

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Vol. 27 August 13, 1913 No. 33

Eliminating the Irresponsible Bidder

FREQUENTLY considerable trouble is caused and unnecessary expense incurred through the acceptance of the tender of an irresponsible bidder. In his anxiety to obtain the contract, he tenders at a low figure, and with the award of the contract his troubles as well as those of the owner begin. He soon recognizes the fact that his prices are low and skimps the work where possible or uses materials not specified. Even with close inspection it is not always possible to prevent this.

Time is always an important factor in any contract. The contractor of limited means is not infrequently inefficient in executing his contract. He lacks the system and the equipment by which the work can be carried to a speedy conclusion. He finds difficulty in financing and the work drags to the annoyance and loss of all concerned. The contract is abandoned, occasionally a lawsuit follows and somebody else must be called in to finish the work.

A first essential in providing a remedy for this condition is a recognition on the part of the owner, that an article obtained at a low price is not necessarily a cheap one. That even if the owner should desire it, he cannot get something for nothing and that there is an economy in paying a reasonable price and having the work done by responsible persons.

The standing of the individual or firm to whom the contract is to be awarded should be known, and if the owner is not thoroughly satisfied, the award should not be made.

The difficulty may be obviated by inviting firms to tender on a given price of work. In this case the owner should be perfectly frank and let the firms know against whom they are competing and reasons should be given for the acceptance of any tender.

It should always be borne in mind that in tendering on any piece of work there is an expenditure of both time and money. That many firms will not tender on certain contracts in competition with men who are bound to have the work at any hazard, knowing that expense is involved without possibility of return.

This state can be remedied only by a system of tendering necessitating the least possible outlay on the part of those bidding. It seems to us that a general adoption of "The quantity system of estimating" as advocated by Mr. Alexander Wright in the Contract Record of July 23, would go a long way in this direction. By this means the cost of tendering would be minimized and the possible variation in the tender price reduced to the very narrowest limits.

The Geological Congress and Its Economical Significance

TO the citizens of Canada has fallen the honor of entertaining the members of the Twelfth International Geological Congress. No more distinguished body of scientists has graced the shores of this continent than that which held its sessions in the city of Toronto August 7th to August 14th.

The society was organized in the year 1878 and since that time has held triennial or quadrennial meetings in the capitals of the leading countries of Europe and America. The fifth session was held in United States in 1891 and the tenth in Mexico in 1906. The last session was held at Stockholm, Sweden, in 1910. Of the 879 members enrolled 625 were in attendance and fully as many were present at the Toronto conference.

The membership consists of professional geologists and persons occupied in kindred professions. Delegates are members who have received special appointment to represent governments, universities, or scientific societies.

The programme consists of papers and discussions on geological questions and theories. There is also a very practical side to the programme. Prior to the meeting and during its continuance as well as afterwards, visits are conducted to those portions of the country where formations of geological interest are to be found.

The Toronto congress came on the joint invitation of the Dominion and Ontario governments and the Canadian Mining Institute and Royal Society of Canada. Arrangements have been made for the visiting scientists to see practically every part of the Dominion if they wish and become acquainted with the mineral possibilities of this country.

The meetings of the congress have a marked economic significance. The co-operation of various governments and scientific societies has been secured and a standardization of geological nomenclature has been evolved and as a result of this a magnificent geological map of Europe is nearing completion. One part of the work accomplished by the Mexican Congress was a geological map of North America and and the Swedish congress published a great work, "The Iron Ore Resources of the World." The executive committee of the Twelfth Congress has undertaken the publication of three quarto volumes and a folio atlas of about 70 maps in colors descriptive of, "The Coal Resources of the World." Another topic of vital economic importance to be debated at this assembly is, "The influence of depth on the character of metalliferous deposits."

To Canada the gathering of this group of notable scientists, representing in all about forty different nationalities, must have a beneficial influence. Abroad, the knowledge of our mineral wealth will be made known in a way not possible through any other agency. At home, there will be a wider spread knowledge of our mineral possibilities together with a more rational method of development, resulting from increased knowledge.

Employ the Canadian Contractor

COMPLAINT comes from Montreal that United States firms are obtaining the preference in the execution of contracts in that city, and that material from the same country is being used for construction purposes instead of material produced in Canada. This is a matter of considerable importance for both the Canadian manufacturer and contractor.

There are one of two features of the case that must be considered. There are firms operating in Canada under legal charters and employing Canadian labor almost entirely, together with a large amount of material produced in this country. These firms are American only in name.

Again, as one contractor pointed out, occasionally the specifications call for material not manufactured on this side of the line. On most contracts time is a very important element and some of the contractors assert that they are occasionally forced to obtain supplies from American houses.

These statements are doubtless true yet the fact remains, that handing a contract over to a foreign firm in preference to a Canadian firm, or importing foreign material when goods similar in quality and price may be obtained within our own borders, is detrimental to the best interests of the country.

We have no antipathy towards the American contractor but we are concerned in the welfare of Canada and the Canadian contractor and manufacturer. It is well to remember that the prosperity of any branch of labor directly affects the prosperity of all others and that the men of this country, who are engaged in the work of building and manufacture cannot be deprived of their legitimate field of operation without affecting the condition of Canadians generally.

We have every confidence that what has been done by others elsewhere can be done by the Canadian engineer and contractor and he should be given the chance. Going abroad for material which is obtainable here does not increase the possibility of procuring an adequate supply in reasonable time in our own country, but tends to a continuance of restricted conditions by limiting the producers' opportunity for output.

Railway construction upon a comprehensive scale is to be undertaken by the Brazilian Government. The sum of $65,000,000 has been voted for the purpose. The construction will be carried out in accordance with a general plan but most of the work will be done in the southern part, to open up the mining and agricultural areas found there.

Editorial Comment

THE unpleasant taste given to drinking water by the use of bleaching powder may be removed, according to Prof. H. N. Holmes, Richmond, Ind., by treating with sodium sulphite or sodium thiosulphite. About 1.2 pounds of sodium sulphite have been found necessary to kill the taste of one pound of the bleaching powder. At 4c. a pound this increases the cost of the treatment about 125 per cent. The sodium thiosulphite is just as efficient and cheaper for at 1.85c. per pound, the cost of purification is increased only 40 per cent. Only one-half as much is required to remove the taste as in the case of sodium sulphite.

* * *

ENGINEERING work on a large scale and of great importance is to be undertaken in southern Italy. In the mountain region of Calabria the rainfall is irregular but abundant. It is proposed to build four enormous reservoirs and regulate the flow of water down the mountain sides. At the outset a 50,000 horse-power turbine electric plant will be installed which will supply power to the neighboring towns and cities.

* * *

THE development of the oil industry near Tampico, Mexico, has forced the Mexican government to undertake engineering work of considerable importance in the vicinity of that city. The harbour of Tampico is to be improved so as to accommodate ships up to 30 ft. draught. The river Panuco, upon which Tampico is situated, is to be dredged. It is estimated that 100,000,000 cubic metres of sand and silt must be removed from the bottom of the river and that the company will have to handle from 8,000 to 10,000 cubic metres daily, in order to complete the work in the three-year limit stipulated by the Mexican government.

* * *

NORTHERN pine, Norway spruce and larch are the principal timbers in use in Vienna for paving. The mountain larch is the hardest of these varieties and in addition has a small proportion of sapwood. The preservatives employed are creosote and a mixture of creosote and chloride of zinc. Creosote alone is used when the blocks are laid on bridges. The mixture of creosote and chloride of zinc is used for pine and fir on the roadways. Chloride of zinc only is used when the blocks are laid under cover. Wooden strips 4 millimetres thick and 4 centimetres high are placed between the blocks. The joints are filled with sharp sand and the surface is covered with a hot mixture of pitch and coal tar and strewn with fine gravel. The life of the wood pavements is ten years and over for heavy traffic and about twenty years for light traffic.

A patent recently granted by the department at Washington shows a boat equipped with a motor, and so constructed as to drive the propeller shaft of the boat upon the rise and fall of the boat, by the action of the waves.

Rail Failures and Their Causes[*]

Classes of Failures—Description of Each Class —Causes of Failures — Remedies Proposed

By M. H. Wickhorst

RECENT years have been active ones in the matter of investigations of rail failures by the railroads, the rail manufacturers and public bodies, and it is proposed in this paper to consider our present information concerning the nature of the failures and their causes.

From the standpoint of the visible condition of the failed rails most of the rail failures may be divided into three classes, as follows:

1. Crushed and split heads;
2. Broken rails (square and angular breaks);
3. Broken bases (crescent breaks).

In addition to these, there are other failures occurring in smaller numbers, such as "cracked webs" (horizontal longitudinal cracks through the web) and "transverse fissures" (transverse internal cracks in the interior of the head).

Statistics concerning the rail failures occuring in the United States have been published for several years by the American Railway Engineering Association, and in Table I. are given a few figures covering rail failures for the year ending October 31, 1911. The tons are long tons of 2,240 lb. and represent the tons of new rail laid.

TABLE I.—RAIL FAILURES IN 1911.

	Bessemer.	Open-Hearth.	Total.
Tons of rails represented..	10,088,706	2,600,008	12,688,714
Number of rails based on 30-ft. lengths...	27,866,348	6,622,736	34,489,084
Number of failures:			
Broken	8,165	1,786	9,951
Head	17,761	2,260	20,021
Web	2,450	515	2,965
Base	2,898	806	3,704
Total	31,274	5,367	36,641
Failures per 10,000 tons:			
Broken	8.1	6.9	7.9
Head	17.6	8.7	15.8
Web	2.4	2.0	2.4
Base	2.9	3.1	2.9
Total	31.0	20.7	29.0
Percentage of Failures:			
Broken	26	33	27
Head	57	42	55
Web	8	10	8
Base	9	15	10
Total	100	100	100
Number of rails for each failure	891	1,234	941

It will be noticed from this table that the failures in 1911 per 10,000 tons of new rail laid were 31.0 for Bessemer steel, 20.7 for open-hearth steel, and the average of all rails was 29.0.

On the basis of number of rails, there was one failure per 891 Bessemer rails, one failure per 1,234 open-hearth rails, and one failure per 941 rails of both steels. This suggests that open-hearth steel is less liable to failure than Bessemer steel, but on the other hand it is probably true that the open-hearth rails were in general of more recent manufacture and probably also contain more of the newer sections. This table cannot therefore be said to be conclusive in its indications in this respect.

The table shows us that there was one failure per 941 rails, but we seem not to have general information of all the failures occurring during the full period of service of a lot of rails. Assuming, for the purpose of forming some idea of the order of magnitude of the average total failures in a lot of rails, that the average life of rails is 8 years, the total failures per lot of rails would average about one failure per 118 rails or something under one per cent.

While the American Railway Engineering Association statistics above referred to indicate an improvement in the general failure performance from year to year in the last three years that they have been kept, we still hear of occasional lots rolled in recent years that give very poor service. As an example may be mentioned a lot of 2,500 tons of 80-lb. A. S. C. E. Bessemer rails rolled in September, 1909, and placed into track in October, 1909. Up to May, 1912, or in a period of service of 2½ years, there were 510 failures classified by the trackmen as follows:

Crushed head and flow of metal	243
Split head	93
Split web	89
Broken	81
Broken base	4
Total	510

This would be 2,040 failures per 10,000 tons; or figured on the basis of 30-ft. lengths, there would be one failure in each 13.7 rails in 2½ years from the time the rails were put into service. I am advised that since May, 1912, other rails have been removed from track and still others at this writing (March, 1913) are developing a condition that will necessitate their removal. Thus far about seven per cent. of this lot of rails have been removed from service on account of failures, mostly of the head, and it seems probable that finally the number may amount to ten per cent. or more. This type of failure, as will be explained, is to be attributed to the interior condition of the ingot from which the rail was rolled, described as segregation and its accompanying conditions.

Crushed and Split Heads

Head failures are the most numerous and most of these may be described as crushed or split heads. This failure consists of an internal crack in the head running lengthwise of the rail anywhere from a foot or two to several yards in length. The external appearance may show only a crushing of the head; but when broken, the rail will show a crack in the interior of the head running lengthwise of the rail. This kind of failure is confined almost entirely to metal showing considerable internal segregation of carbon, phosphorus and sulphur, attended more or less with laminations and slag seams. Under wheel loads, the top of the head flows sideways and if the interior metal cannot likewise flow sideways due to internal flaws or due to

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Before American Society for Testing Materials.

brittle material in the interior, it develops a crack which grows and later forms a split head, the crack generally coming to the surface at the under side of the head at its junction with the web. Frequently the crack extends downward into the web and comes to the surface at the side of the web, and then the trackman is apt to report the failure as a web failure, whereas in reality it was a head failure.

Split heads may thus be said to be due to lack of transverse ductility in the interior, of the head, due mostly to segregation.

Broken Rails

The next largest class of rail failures is that called "broken" rails, including square and angular breaks; that is, the rail breaks through the whole section more or less vertically. This type of failure is most predominant in winter, particularly in severely cold weather, and may be termed "winter disease" of rails. The severe winter of 1911 and 1912 brought out a very abundant crop of such failures on the northern roads. An examination of the fractures of such rails shows that the fracture is upward through the section; that is, it starts from the base, and the rails also show longitudinal cracks or seams at the bottom of the base. Mr. H. B. MacFarland, Engineer of Tests, Atchison, Topeka and Santa Fe Railway, has made an interesting report in which he shows that most "broken" rails were accompanied by half-moon base fractures, which observation has also resulted from other investigations. Probably the most prominent feature of the appearance of most "broken" rails, is what may be called the "scalloped" fracture across the bottom of the base; that is, the fracture is not straight across the base but one side is concave or re-entrant with a sharp corner, while the other side is pointed and dovetails into it. The concave side of the fracture generally shows also a seam at the bottom of the base.

Seams in Base of Rail

Rails frequently contain longitudinal surface seams, and in this connection a study of the behavior in the drop test of a rail containing seams in the bottom of the base is important. These base seams vary in depth from a hundredth to a tenth of an inch and occasionally deeper. When tested in the drop test in the usual manner, the rail ordinarily breaks at or near the place where hit by the tup due to exhaustion of the longitudinal ductility of the part in tension. Occasionally, however, when tested with the base in tension—that is, with the base resting on the supports—the fracture occurs near one of the supports. A 100-lb. rail was broken in the drop test with the base in tension, supports 3 ft. apart, when given one blow of a 2,000-lb. tup from a height of 20 ft. The pressure of the rail on the support caused some side spread of the base at this place, which in turn opened up a seam. A piece of the flange broke, and a fracture occurred through the whole section 3½ in. from the support, as a secondary break. The failure of this rail occurred long before the longitudinal ductility was exhausted and may be considered as due to insufficient transverse ductility at the bottom of the base because of the presence of seams.

When tested with the head in tension, the result is of a similar nature if there is a seam in the base at the place where struck by the tup. Here again the blow of the tup caused a side spread of the metal of the base where struck, which in turn opened up a seam causing a failure from the top side, not due to exhaustion of the longitudinal ductility of the head.

Base Failures

About ten per cent. of all rail failures, according to Table I., are base failures, mostly half-moon or crescent-shape pieces broken out of the flange. These occur mostly at ties and appear also to be largely attended with seams in the base. The origin of the failure in this type, as with "broken" rails, thus appears to be the seams in the base and these two types should therefore be classed together as regards cause of failure.

Other Failures

A type of failure that has attracted considerable attention in recent years, is the "transverse fissure" or "oval spot" in the interior of the head. This type was first brought into prominence by a report by Mr. J. E. Howard, of the Bureau of Standards, on a rail ascribed as the cause of a bad wreck on the Lehigh Valley Railroad at Manchester, N.Y., on August 25, 1911. Mr. C. D. Young, Engineer of Tests of the Pennsylvania Railroad, has also presented an interesting report of his investigations of some failures of this type that occurred on the Pennsylvania Railroad. While these reports contain valuable data and good suggestions, the writer feels that a full explanation of the cause of this type of failure has not as yet been worked out, which necessarily must precede effective action for remedying the trouble. This kind of failure is occasionally followed with disastrous results, but fortunately occurs only in small numbers except perhaps under some special conditions.

Another type of failure that constitutes a small percentage of the total failures is the "cracked web," in which the web is cracked through from side to side running lengthwise of the rail; but here again the writer is not aware of a final explanation having been worked out.

Service Conditions as Causes of Failures

Wheel loads have been increasing ever since the beginning of railroads and the tendency seems to be to still further increase them, at any rate as regards the average wheel loads. The heavy wheel loads have been given as the cause of rail failures. While it is true that the loads are heavy, it is also true that failures are confined to what may be called defective rails, and that most rails stand up under the service. The failures classified as crushed and split heads have for some time been recognized as due to defective metal; and although "broken rails" eluded us for a while, as attributable to the material, we may say these also are to be ascribed to defective material although not defective metal.

Bad counterbalance, flat wheels and other abnormal conditions kink good rails and throw them out of line, although, of course, the defective rails are more promptly found by such abnormal conditions. A rail tested in the drop test will ordinarily stand a bend of several inches in a span of three feet. Of course the railroad that persists in bending and kinking its rails will soon have an unrideable track for satisfactory service. It seems to be true that such matters as weight of rail or design of section are of but small importance in the matter of rail failures, but are rather matters more concerning the rideability of track and cost of maintenance.

Remedies

The above part of this paper deals with diagnosis and I think we have now arrived at a point where we may feel considerable confidence that we have the correct diagnosis of the causes of most of the rail failures. About fifty per cent. are ascribable to low transverse ductility of the interior of the head due to segregation (and its attendant conditions) and traceable to the interior condition of the upper part of the ingot. About forty per cent. are ascribable to low transverse ductility at the bottom of the base, due to the presence of longitudinal seams at the bottom of the base, and probably the origin of these seams is to be looked for in the rolling of the steel. This leaves about ten per cent. not yet diagnosed. What remedies will finally be applied I, of course, cannot say, but below are given some thoughts as to the directions in which betterments are to be looked for.

According to Table I., 55 per cent. of the rail failures of 1911 were head failures and 8 per cent. were web failures, and as already indicated most of these may be classified as crushed and split heads, attributable to excessive segregation in the interior of the ingot together with the conditions which ordinarily attend such excessive segregation, such as sponginess and an abnormal softness of the steel at the outer part of the rail section around the segregated region of the rail. Thus, it appears that the remedy for about fifty or perhaps sixty per cent. of rail failures, is to be looked for in a reduction of segregation below the point where it causes a brittleness of the interior metal of the rail. The condition of sponginess is worst at the top end of the rail bar, but the segregation reaches its worst condition at a varying distance from the top end—ordinarily about fifteen per cent. of the weight of the ingot from the top end of the ingot—and varies in degree from harmless segregation to a condition sure to result in bad service of the rail. It seems to be well established that well-deoxidized, quiet-setting steel has not the concentrated segregation found in other steel and is free from sponginess, but the central pipe extends farther downward into the ingot. The main cause for head failures is, however, the excessive segregation, and to avoid this requires a sufficient discard from the top of the ingot, or steel treated with sufficient silicon, titanium or aluminum. It is usual for rail specifications to put a maximum limit of 0.20 per cent. on silicon, but it is necessary to have 0.25 per cent. or more silicon in the steel in order to obtain its full influence in reducing sponginess and segregation. When titanium is used, 0.1 per cent. or more of metallic titanium is probably the proper amount with which to treat the steel. Talbot recommends aluminum used in amounts of 2 oz. per ton or about 0.006 per cent.

It seems that we must come to a well-deoxidized dead-quiet-setting steel, but then we have a deep pipe to deal with when the steel is cast in the usual manner into ordinary open-top iron moulds. There has been recently, and still is, considerable experimental activity toward overcoming this condition and the next few years may see a practicable and economical solution of this problem of pipe, available on a larger working scale. Hadfield recommends a sand top to the mold and special arrangement to keep the top metal liquid till the bottom of the ingot has set. Talbot recommends a pre-rolling or liquid compression, and a number of other means have come to public attention lately. Possibly, also, some improvement may be obtained by closer attention to the details of the present casting process; or, again, satisfactory uses may be found for the upper part of the ingot for other purposes. The conclusion seems to be emerging, however, that for rails, a well-deoxidized, quiet-setting steel must be used, in order to avoid excessive segregation and to obtain rails with a uniform hardness at the wearing surface in the several rails of an ingot. A solution of the ingot problem means the prevention of about half of the failed rails of the country.

As indicated above, about forty per cent. of the rail failures are traceable to a longitudinal seam at the bottom of the base. The seam does not show on the new rail and cannot be discovered by inspection, but shows up when the failed rail is examined. We have very little satisfactory information as to the origin of these seams (although they seem to be produced in the rolling), but the matter is being studied more critically and we hope in the course of time to have more satisfactory knowledge of the subject.

Conclusion

In conclusion, we may say(considering the number of failures) that about fifty per cent. of the rail failure problem consists of obtaining sound metal of fairly even composition, and about forty per cent. consists of so rolling the metal into rails as to avoid seams in the bottom of the base. The earnest activity and the cooperation between all interests to produce improvement in the matter of rail failures, is such that we may well be hopeful of the future. The steel mills have freely offered the facilities of their works to the railroads for experimental work, and I in particular wish to acknowledge the uniformly kindly treatment accorded me in my work at the various mills. As a still further improvement of the general situation, I would urge upon the metallurgists and other officers of the steel mills that they be more forward in publicly presenting the results of their studies and investigations.

Tracing Water Mains

THE difficulty of tracing underground water mains when no exact record has been kept of their position is considerable, and the work of finding them is sometimes too costly and difficult to be practicable. The value of the simple electrical devices which enable the modern water engineer to trace such mains accurately without disturbing the ground is great. It is, for instance, quite an easy matter to connect one of the wires of a battery to a house stopcock and the other to a hydrant or valve on the town main and thereby to induce a current of electricity along the service pipe running between the main and the house. The pipe then becomes a conductor, and when an electric coil is brought within the electric field of this conductor, a current is induced in the coil which will cause a sound in the telephone receiver connected to the coil. This sound will increase or diminish as the coil approaches or recedes from the underground conductor, but will cease when directly over it. Small batteries such as those used in an automobile are used for creating the necessary current. It is needless to dwell upon the obvious advantages of the method.

The use of cement, especially in foundation work, is rapidly increasing in Norway, and during 1912, with high prices demanded by foreign manufacturers, the local industry had a very prosperous year. For the large plans at Slemmestad a great amount of new machinery has been ordered. Until very recently the imported cement was so expensive as to preclude its use, but with the establishment of local plants it has gradually become cheaper. The use of reinforced concrete is also beginning to be general in the large cities of Norway.

Ozone Applied to Water Purification

Ozone as a Purifying Agent—History of its Development—Plants in Operation — Economical Production of Ozone

By Russell Spaulding, State Department of Health, New York

THE growth of cities causes pollution of the water courses by sewage being discharged into the streams, and it has become more and more difficult, not only to get large enough water supplies, but to get pure water supplies. The enormous amount of money expended for metropolitan water systems like those of Boston and New York must inevitably reach a limit, and some method must be devised to purify the courses by the removal of the dirt and the destruction of the pathogenic bacteria.

There have been three methods hitherto suggested. First, filtration, which is efficient but more or less cumbersome and expensive and not always practical. The second method in general use is rapid filtration for dirt and treatment of the water with chemicals, of which the most promising is chloride of lime. The third method which has been suggested is the treatment of water with ozone after rough filtration for coarse dirt.

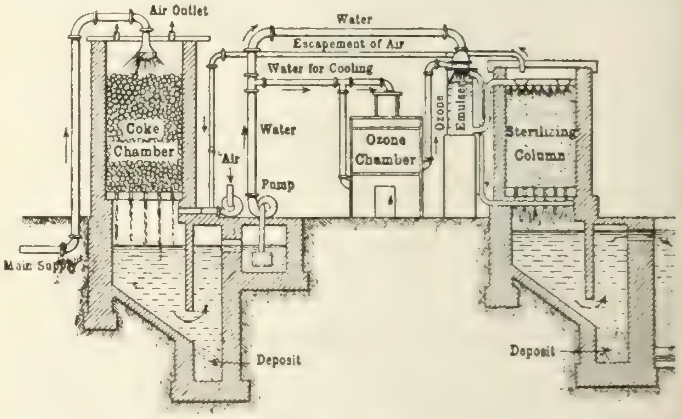
The use of ozone as a purifying agent has received such varied publicity that the history of the discovery and development of the gas needs but brief attention. A Dutch physicist, Van Marum, in 1783, while studying the behavior of gases in the path of electrical discharges, noted that oxygen gave a decided odor. But not until 1840 was this peculiar form of oxygen recognized as a distinct gas. In that year Friedrich Schoenbein, a German chemist and professor at the University of Basel, Switzerland, showed that oxygen after being subjected to electrical stress, possessed peculiar chemical properties. To this gas he gave the name "ozone." The gas remained more or less of a scientific curiosity for a number of years, and the study of its properties seems not to have been attempted for practical ends until Berthelot took it up in 1890. He was followed by a long line of experimenters, most of them Europeans. Only a few of the army of experimenters made definite contributions to the advancement of the art of producing ozone in large quantities on a commercial scale and with a minimum expenditure of power.

Ozone is a form of oxygen in which the atoms of the molecule have a different arrangement from that of ordinary oxygen. It is very unstable and will revert to oxygen in a very short time if left to itself. When, therefore, it is put into water it will speedily assume the condition of oxygen and be quite beyond the possibility of polluting water. Consequently its use is beyond any criticism which may be directed at the chemical treatment which may remain as an impurity. Ozone could not be an impurity in water, for it changes instantaneously. It owes its efficiency in acting on bacteria to the fact that it cannot remain in the condition of ozone, but breaks up and forms free oxygen, which is an extremely powerful oxidizing agent. This oxidization destroys bacteria with incredible rapidity in the purification of water by ozone, which in turn leaves no trace of itself.

The utility of ozone as a bactericide, through its marked oxidizing properties, was pointed out by de Meritens in 1886 and Froelich about 1890. To-day there is little question of the efficacy of ozone as a commercial chemical and sterilization agent but there are questions of practicability, related mostly to the cost of production and utilization, and to the ease of maintenance of generating apparatus. By the improvement and refinement of the generators, the cost of production has become a small part of the cost of any complete process for using ozone for purifying or bleaching. This condition arises largely through the expense of forcing contact between the ozonized air and the material to be treated.

The process about which most interest centers, naturally, is the purification of water. There are elements in the proposition to kill all bacteria and to get rid of organic contamination by introducing "electrified air" that appeal to the popular imagination as no proposal of filter or chemically sterilize water can. It has been demonstrated that ozone is a simple and effective sterilizing agent and leaves no residue in the water repugnant to the public mind as use of chemicals would. Whether or not an ozone plant is the best thing for a given location often simmers down to a question of the costs, and these depend to a very large extent on local conditions, so that results obtained in one place are to be applied with caution to another place and only under the advice of competent engineers.

The earliest attempt to produce and utilize ozone on a commercial scale was that of Baron Tindal at Oudshoorn in Holland, in 1893. Since then great improvements have been made in ozone-generating apparatus, both from the point of view of reliability and of economy. Baron Tindal's first apparatus yielded about 2 grammes of ozone per kilowatt hour, whereas the plants now in use in Europe produce from 40 to 50 grammes per kilowatt hour. Even this efficiency can be improved on, and the United States may soon redeem itself for its slowness in adopting a system already so well developed in Europe by outstripping the old world in the production of economical apparatus.



General arrangement of plant at Nice, France.

Baron Tindal was followed by such men as De Frise, Schneller, Vandersleen, Vosmaer, Otto, Abraham, Marmier, Siemens, Gerard, each contributing to the improvement of apparatus and application. That these efforts have finally placed the use of ozone on an economical commercial basis is shown by the number of plants now in operation in Europe. The Otto and Siemens systems in use in these plants represent the best so far attained in Europe.

Since 1902 plants using ozone for the sterilization of drinking water have been installed in many European cities and in at least three in South America. Among the cities possessing such an equipment may be mentioned Marseilles, Nice, Paris and Toulon in France; Wiesbaden, Leipzig, Hamburg and Munich in Germany; Ravenna, Spezzia and Florence in Italy; St. Petersburg in Russia, and Valparaiso in Chili. In some cases the plants are the property of private manufacturing concerns, but in many cases they have been installed by the municipality.

The Plant at Saint Maur

The plant at Saint Maur is the largest one in France. It was enlarged in 1910 to its present capacity of 24,300,000 gallons per 24 hours and is the outcome of the crude attempts of Tindal in 1895. It has been remodelled many times and to-day embodies the cumulative benefits of the efforts of Tindal, Otto, Marmier, Abraham and Siemens. This plant is situated near Paris on the River Marne. The water pumped from the river is first filtered through sand and then sterilized by means of ozone. This ozone is drawn into the water by Otto aspirators. The water then trickles down through gravel contained in a sterilizing tower, meeting an ascending current of ozone which further sterilizes it. From this tower the sterilized water runs into a large reservoir, from which it is pumped into the city of Paris proper.

Plant at Villefranche

The ozone plant at Villefranche supplies all the towns on the French Riviera from Villefranche to Mentone. The towns supplied are: Villefranche, La Condamine, Eze, Saint Jean, Cabbe-Roquebrune, Monaco, Mentone, La Turbie, Beaulieu, Monte Carlo. The water is taken from the River Vesubie, first filtered and then sterilized by ozone. The plant was put in operation in 1911 and has a capacity of 7,020,000 gallons per 24 hours.

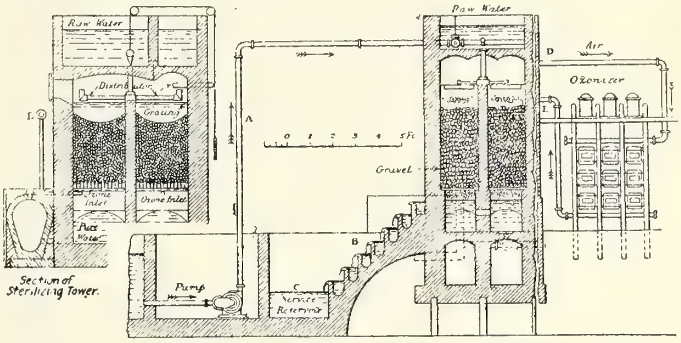
The water of the river Vesbuie was tested after being ozonized with the following results: The filtered water was a grayish-yellow; ozonized water was a transparent blue shade. The chemical composition was in no manner changed. The organic contents of the water were sensibly lessened. Samples of 50 c.c. in emery-stoppered bottles maintained for 8 days at a temperature of 38 deg. C. remained clear and odorless, and no traces of peroxide of hydrogen were found in the ozonized water. No bacilli-coli or pathogenic bacteria were found.

Plant at Nice

Early in 1904 the municipality of Nice, in Southern France, entered into a contract with the French Ozone Company for the erection of an ozone sterilization plant near the reservoir of Bon-Voyage. This plant, with a capacity of 6,480,000 gallons daily, was completed in 1905. The following are some of the requirements made by the city:

1. Capacity of sterilization, regular and continuous, 6,480,000 gallons per 24 hours.
2. Maximum allowance for upkeep $5,000 per annum.
3. The city will furnish free hydraulic power—13,157 kilogrammes on the axis of the turbines.
4. The Ozone Company guarantees that the treated water will not contain any pathogenic bacteria.
5. The maximum harmless bacteria is not to exceed 10 per c.c., exception being made for B. Subtilis.
7. The Ozone Company guarantees that the chemical qualities of the water will not be altered except they be improved, that they will not introduce in the water any harmful foreign substance, and that no trace of ozone will remain in the treated water as it emits from the reservoir of Bon-Voyage.
8. The Ozone Company further guarantees the absolute innocuousness of the process.
9. The Ozone Company will be responsible for any abnormal corrosion of the conduits.
10. Price of entire installation to be 240,835 francs —$48,167.

The success of this installation is evidenced by the fact that in 1909 the municipality of Nice ordered installed a second plant at Rimiez with a capacity of 3,780,000 gallons per 24 hours.



Sectional views of plant at Wiesbaden, Germany.

Plant at Paderborn

As a result of the experimental plants installed at Berlin in 1896 and at Martinikenfeld in 1898, it was decided to build an ozone water-purification plant on a large scale, in order to determine whether or not it would prove reliable, efficient and economical in a municipal plant. The town of Paderborn in Germany was chosen for the initial plant. The plant was erected and officially turned over to the municipal authorities in the month of August, 1902.

The plant has a capacity of 500,000 gallons of sterilized water per 24 hours. It has been operating uninterruptedly since 1912, never once failing to perform its duties in an entirely satisfactory manner. Bacteriological examinations are made regularly and at frequent intervals each day. Since the day the plant started, in 1912, these examinations have shown an entire absence of pathogenic bacteria. A duplicate of the Paderborn plant was erected in 1903 to supply the town of Wiesbaden. The plant is located near the River Rhine at Schierstein, and the sterilized water is pumped over to Wiesbaden.

Plant at Saint Petersburg

The city of Saint Petersburg in Russia is dependent on the River Neva for the major portion of its municipal water supply. These waters were contaminated to an alarming extent by typhoid and cholera bacteria. After a thorough investigation of all available means for the purification of water, investigations which extended over a considerable period of time, the authorities of the city of Saint Petersburg decided that the most reliable and effective agent was ozone. Researches made at the Pasteur Institute in Paris were made the final basis of the Russian authorities. Work on the plant was started in 1909 and was completed in

November, 1910. The water after being pumped from the river is first treated with sulphate of alumina as a coagulent; it is then filtered through rapid filters. Careful bacteriological examinations show that both before and after filtration the water contains an abundance of typhoid and cholera bacteria, whereas after ozonization there is invariably a total absence of these and all other pathogenic bacteria.

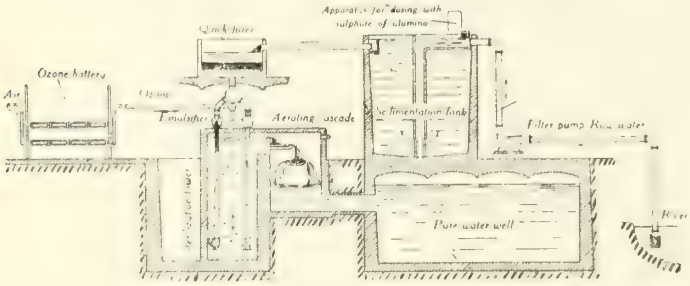
Conclusion

The records of the foregoing ozone purification plants, and their successful operation over an extendtd period of time, have established beyond cavil that ozone as a purifying agent is both efficient and economical, so that an extended discussion on the subject seems superfluous.

It may be well, however, to emphasize the fact that in contradistinction to all other purifying agents, ozone possesses one signal virtue in that it is absolutely non-toxic. Furthermore, it is insoluble in water to any appreciable extent, so that "overdosing" is impossible.

Aside from its wonderful and unfailing bactericidal power, ozone totally removes from water all traces of odor, color and taste due to the decomposition of organic matter. Ozonized water is never flat to the taste—it is not only perfectly hygienic, but satisfies the most delicate palate.

To summarize, ozone destroys in water all that which is harmful or distasteful and in no manner changes the mineral qualities. The successful application of ozone to water purification is dependent upon a number of factors, none of which may be disregarded with impunity. The failures that have occurred have been due solely to faulty design in the electrical or mechanical devices used. Ozone, as such, never has and never can fail to perform its functions properly.



General view of plant at St. Petersburg, Russia.

The first problem that confronted the pioneers in this art was the economical production of ozone. Ozone can be produced, chemically, thermically and electrically. The first two methods were soon discarded in favor of electrical methods, which, however crude at the start, offered the best promise of ultimate success.

The efficiency of production of ozone is even to-day quite remote from the theoretical efficiency. The early efforts produced an efficiency of only 3 grammes of ozone per kilowatt of energy. The present efficiency, prevalent in the European plants described in this report, varies from 40 grammes to 60 grammes of ozone per kilowatt of electrical energy.

In some instances much higher efficiencies have been obtained by supplementary devices, such as refrigerators and dehydration of air to be ozonized, but these devices are not only expensive and cumbersome but they tend to complicate the apparatus as a whole and diminish its dependability. Efficiency in ozone production has increased with the efficiency in electrical apparatus, such as dynamos and transformers, but little progress has been made in increasing the efficiency of the ozone apparatus itself.

Aside from the generators required to supply alternating current and the transformers used to step-up the potential to its required power, the ozone apparatus consists of electrodes of metal separated by an air space, dielectrics, such as glass, being interpolated between electrodes to produce a brush-discharge. This brush-discharge acting on the air disturbs the atomic balance of the oxygen, which is normally di-atomic, in such a manner that more or less of the atoms recombine in an unstable tri-atomic form which is called ozone.

This brush-discharge is accompanied by the phenomena of light, heat and noise, all of which absorb energy, thereby reducing the percentage of energy available for the creation of ozone. The heat generated tends to cause a reversion of ozone into oxygen and furthermore lessens the dielectric resistance of the glass dielectrics, making them liable to puncture by the high tension current—thus putting the apparatus out of commission.

To overcome this difficulty various means have been resorted to, to prevent a rise in temperature, such as refrigerating the air before it reaches the electrodes of discharge, or surrounding the electrodes with some fluid such as oil or water, for the purpose of carrying off the heat as fast as generated. These palliatives, though they make the operation of ozone generators possible, only add to the losses already entailed in the generation of the objectionable heat. The obvious remedy for low efficiency is, therefore, to so arrange the electrical circuit that the major portion of electrical energy supplied to an ozone generator shall be used in the conversion of oxygen into ozone, and that only a small portion shall be lost in a non-productive manner. The non-production of heat should be sought rather than its elimination by cooling means.

To summarize then, the main desiderata in generating ozone are:

1. A supply of alternating electric current at low cost.
2. An efficient transformer to obtain high tension.
3. Ozone electrodes that do not generate enough heat to
   a. Disrupt the dielectrics,
   b. Cause reversion of ozone to oxygen,
   c. Require external means for cooling.
4. Ozone electrodes that will approach the theoretical efficiency much more closely than the various systems now in use.

Such an ozone generator does exist and when offered to the public will revolutionize the art. Pending such time it would be improper to give a full description of it.

The efficiency in the application of ozone to the purification of water is dependent entirely upon mechanical factors. Bacteria are immediately destroyed and converted into CO_2 when brought in contact with ozone. The only failure in ozone water-purification plants that have so far occurred have been due to a failure in breaking up the water in sufficiently fine particles and in properly contacting these small particles with ozone. I speak of failures in the technical sense, that is, failure to produce odorless, tasteless, colorless water, entirely free from pathogenic germs, by means of ozone. Failures might occur from a commercial point of view, because of excessive overhead charges or too high a cost of maintenance due to low efficiency or unreliability of apparatus.

Road Maintenance and Improvement Present and Future*

By Harold Collins, Assoc. M. Inst. C.E., Deputy City Engineer, Norwich, Eng.

IN order to emphasise the altered conditions which road engineers now have to meet as compared with those of ten years ago, at that time the number of mechanically propelled vehicles, apart from traction engines, was so small as to be negligible; the Motor Car Registration Act did not come into force until 1904, and the first estimates of the number of vehicles were made by The Car in 1906 and 1907, which paper has continued this practice year by year. Figures are appended for the years 1906, 1907, 1909 and 1912:—

Year	Motor Cars	Motor Cycles	Heavy Motor Vehicles	Total
1906	49,300	48,700	3,200	101,200
1907	65,800	55,000	4,520	125,320
1909	101,169	73,821	6,765	181,755
1912	175,247	132,245	12,627	320,119

The figures after the year 1909 are based on actual returns supplied by the registering authorities of the United Kingdom; these figures do not correctly give the number of vehicles on the road, as a considerable number have been broken up or sold out of the country. The distance travelled by these vehicles on the highways would possibly be 900,000,000 miles annually.

Recently in Norwich a census of traffic was taken on practically all the main roads extending over seven successive days, and the proportion by weight of mechanically propelled vehicles was found to be 30 per cent.; tramcars were not included in the returns.

The wheels of motor vehicles, more especially those of the heavy or commercial type, have been designed without the slightest consideration, except as to width of wheel tread in relation to load, and to a very limited degree as to diameters, for the road surfaces on which they have to run. Failure in adapting wheel proportions and loads to the roads on which they must run has led to much unfair criticism of road engineers. Critics fail to consider but one side of the question. Those critics who trouble to think will probably conclude that railway engineers must adapt their rolling stock to the track on which it must run. Why should not the same consideration be given when the roads of the kingdom are in question? The loads and general conditions on railways have not been suddenly and completely changed in such a manner as the road traffic; it has been of gradual growth, and so the railway engineer has been enabled to keep pace and provide suitable roads. Notwithstanding this, there have been many instances of locomotives being withdrawn owing to their severity on the roads on which they run. Whoever heard of a steam or motor wagon owner doing such a thing? The author has personal knowledge of steam wagons with a loaded rear axle weight of over 10 tons with a wheel diameter of less than 3 ft. 6 in. and tires of 12 in. width.

Experience in Norwich has been that with these excessive axle weights of commercial vehicles it is most difficult to make a road which will stand. Even thoroughly well-paved granite setts fail, the setts in many places being crushed and the concrete bed damaged. The author is of opinion that the regulations for these vehicles require amendment.

Regulation of Wheel Loads

The city engineer of Norwich, in November, 1912, put forward several suggestions to the Joint Committee on Loads on Highway Bridges for the regulation of wheel loads, wherein due consideration was taken into account for diameters of wheels and widths of fires, and to avoid the necessity for circulation a diagram was given. A standard load of 7 cwt. per inch width of tire was assumed for a wheel of 5-ft. diameter, and a maximum load of 5 tons per wheel or 10 tons per axle was allowed, the reason for suggesting this standard being that ordinary carts with wheels of 5-ft. diameter by 4-in. tire, loaded to 28 cwt. per wheel, do not cause unreasonable wear, and the lengths of tire in contact with road on account of yield of road surface, etc., was taken as 1 in. It will be seen that the proposal would allow 5½ cwt. per inch width of tire for wheels 3 ft. in diameter to 8½ cwt. for wheels 7 ft. in diameter; thus the steam wagon referred to previously, instead of having driving wheels of 3 ft. 6 in. diameter by 12 in. wide tires, would require to have wheels 7 ft. diameter by 12 in. width, or 5-ft. diameter wheels by 14 2-7 in. wide. A limit should be fixed to the width of tires on account of the difficulty in uniformly distributing the load across them because of road contours.

These were suggestions, and were not put forward as being arbitrary allowances. Possibly, as the tire increased in width (up to a certain point) it might be found possible to increase the allowable load per inch in width. The suggestions only have reference to vehicles fitted with steel tires; where the vehicles are fitted with soft tires, the length of tire in contact with the road is increased, and the conditions very considerably altered, and the author suggests that for such vehicles the limit of load should be 7 cwt. per superficial inch of tire in contact with the road. That regulations are necessary none can deny if they have examined any country roads which are regularly used by heavy motor vehicles.

These suggestions are general, and do not refer to special cases where exceptionally heavy weights have to be hauled over a road—such as, for instance, between a boiler works and a station or docks, where the road would have to be made specially to suit this purpose, and a speed limit fixed. In those cases where an abnormal load has to be transported over a road not intended for such weights, the persons responsible for the transport must take necessary steps as to the provision of plankways or otherwise to prevent damage. Skid-pans should be properly made, shaped and adjusted so as to prevent cutting into road surface, and the maximum pressure thereon should be limited to ½ cwt. per square inch of surface in contact with the road. All brakes should be so constructed and adjusted as not to prevent revolution of the wheels. The taxation of motor vehicles also requires to be entirely revised, as the steam-driven steel-tired commercial vehicle, which is the most severe on the roads, pays no contribution beyond the registration fee.

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* The Surveyor.

Construction With Tar-Macadam

The author's experience of road construction with tar-macadam, using ordinary gasworks tar (not such as the various proprietary materials supplied by firms who have specialised in their construction), is that results are never certain, and he is of the opinion that a very rigid specification requires to be adopted, and the tar supplied should be examined periodically by a chemist who has made a special study of its use in road construction. He is of opinion that examination of tar in the ordinary laboratory of a road engineer is of very little use, the work requiring the knowledge and experience of a specialist. The author is further of the opinion that tar-macadam should be made mechanically with properly designed machinery which will properly measure, mix and heat the constituent parts. He thinks far more uniform results are to be looked for from this method of manufacture than by manual methods.

The proportions of the different-sized materials should be carefully ascertained by experiment, dried (the stone to be dried sufficiently to drive off all moisture, and not heated more than is necessary for this purpose), heated and mixed with tar at the correct temperature. This will make a very dense road when properly consolidated by rolling, and will need no sealing or top coat of small stuff; in fact, it will be better without, as the author's experience is that it is very difficult to keep a thin top coating of small material properly attached to the tar-macadam proper.

Insufficient attention is generally given to mixing the stone in proper proportions for tar-macadam. The aim should be to get the greatest practicable proportion of stone and the smallest of tar (provided there is sufficient). To do this in the most effectual manner it is necessary that the stone be graded into several sizes—say seven—and the grades mixed in such proportions as are found to give the heaviest weight per cube yard. The author thinks that the most perfect result would be obtained by mixing each grade with the tar or other matrix separately, and while still hot mixing into the mass, adding first the next largest to the largest and so on, until the last to be introduced would be the smallest. Up to the present he has heard of no one taking this care, but with proper machinery he sees no practical reason against its being done.

He has recently seen tar-macadam which was made with gasworks tar and iron slag, and laid over six years ago in a busy town near London, and subject to heavy traffic such as motor buses and railway lorries, which is still in perfect condition and appears to have a considerable life; the appearance is similar to that of a tessellated pavement, and a loose stone could not be seen.

Some good results have been obtained in Norwich with the grouting method, in some cases using bitumen, and in others Brodie's Pitchmac; Plascom has also been used. Local flints were used for the bottom coat consolidated to a depth of 3 in. by rolling dry; the bitumen mixture, to which is added sand and cement, is then run in and rolling is repeated. On this is spread a 2-in. layer of 1½-in. granite, which is rolled dry, then grouted up similarly to the bottom coat, rolled again and sprinkled with chippings. These roads have stood well, except as to one road, which had too much bitumen grout run in, which worked up in the hot summer of 1911, and caused a great deal of trouble by pulling horses' shoes off. This difficulty was overcome, and the road is now in excellent condition. The cost of roads constructed upon this method in Norwich works out at about 3s. 5d. per super. yard. With this class of road, which was generally constructed along tramway routes, a maximum cross-fall of 1 in 30 was fixed, and was not laid in roads having a gradient steeper than 1 in 20 on account of its being more slippery than water-bound macadam; the flatter cross-fall, which is more necessary than with water-bound macadam, is, of course, an advantage to traffic, and the water will run off quite as well as from water-bound macadam roads with their usual cross-falls. Further, the road is punished less by heavy motor commercial vehicle by reason of greater distribution of traffic.

Although this class of road has been constructed in Norwich in winter, it is not advantageous to do so on account of the increased cost through sheeting up, and having to stop the work frequently, and it is almost impossible to prevent the stone from getting wet at times before grouting.

Tar-Painting

Where the roads are of secondary importance, tar-painting annually appears to fill many requirements. One of the methods in Norwich is to apply the tar received from the gasworks at a temperature of about 180 deg. to 200 deg. Fahr. by means of an old water cart, which is fitted with two outlets at the rear; a brush, extending over the full width of the cart, is trailed behind and weighted; this spreads the tar more or less uniformly, and a couple of men following up with ordinary road brooms brush it in well, and local pea gravel is spread. Before the tar is applied all dust and dirt are thoroughly brushed off. The cost of this work amounts to about 1⅞d. per super. yard. Llewellins & James' tar-spraying machines are also used, and the cost with these amounts to 2.18d. per super.yard, using prepared tar at 3 2-3d. per gallon.

Tar-painting greatly extends the life of certain roads, such as the outlying roads of such a city as Norwich, where it is not feasible to regularly water them. It prevents their breaking up in hot weather, and the scouring action of heavy rains; the author had a very good example of this in the August flood of last year in Norwich, in the case of a road carried on an embankment across the river Wensum Valley on the up-stream or north-west side of the city. The bridges in this embankment were totally inadequate to pass the flood waters which rose and flowed about 4 ft. deep across the top of this embankment road. The middle portion of the road, which had been tar-painted, was not damaged, except at the up-stream edge, which in places had been doubled over in sections of about 9 in. wide; the sides which had not been so painted were deeply scoured.

Direction Posts

The author is of opinion that the usual system of direction posts is quite inadequate for fast traffic, and requires considerable alteration to suit the traffic now on the roads. For instance, when approaching a narrow fork, it is very often impossible to read the usual type of signpost until the traveller is practically opposite it, and it is a common experience to take a wrong turning, the chances being equal that he will do so. The type of road direction board suggested is that which has been adopted in Norwich to a considerable extent. This type can be read some considerable distance in advance, and so prevents the annoyance of taking the wrong road and danger of endeavouring to turn into the right road at the last moment; there have been numerous accidents arising from this last cause.

The boards should be placed vertical, and at such an angle in plan that travellers aproaching from any road toward the board should be enabled to have a clear view of one face. The boards require to be of sufficient size to enable the names of the towns, etc., thereon to be painted in block letters, 4 in. deep, with arrows showing the direction of the roads; a traveller should imagine the board laid down as he would a plan—horizontally—in front of him in the way he is travelling. The arrows would then orientate—i.e., be parallel with the roads leading to the places to which they refer. Where it is desired to direct to a road making an acute angle with one on which the vehicle is travelling, it is advantageous to supplement the arrow with a pointer or model hand.

Some people who have had no experience of such boards do not clearly understand them at first, but the majority do, and the author is of opinion that if some such direction board as this were generally adopted they would soon be understood and appreciated by all road travellers. The boards should bear at the top the name of the district in which they stand, and should also give the mileage to the various places named thereon. They should also be illuminated on both sides if lighting be available. In towns they can generally be so placed as to take the place of light standards.

The author is not in favour of making carriageway turns from side roads into main roads too easy, but would like to see extended the practice of making visible to each other the traffic on cross, side and main roads. In Norwich mirrors have been used for the past eighteen years at certain narrow and busy street junctions, such as where one street runs into another at right angles.

Opinion is rather divided, however, as to the utility of these, as drivers generally fail to appreciate exactly what they see reflected in them owing to their small experience with them in consequence of the fewness of such mirrors provided by highway authorities. To avoid endless fittings on the job, the attachments are designed to generally fit the particular situation, and are made adjustable in plan and elevation so as to get each mirror into the exact plane for the most effectual results. Most of those erected in Norwich have been destroyed by runaway horses or mischievous people, and notwithstanding demands for reinstatement the corporation have not seen fit to incur the cost.

Asphaltic Concrete as Paving for Residence Streets

THE question of permanency in highways has become of vital importance both to rural and urban municipalities. The very great change in vehicular traffic with every prospect of increase rather than decrease has made it absolutely necessary that the subject should be thoroughly investigated and the labor of construction placed upon a scientific basis. We publish herewith an abstract of a paper prepared by Mr. Lynn White for the Civil Engineers Society of St. Paul. Mr. White is the chief engineer of the South Park Commissioners, Chicago, and a man of wide experience in the matter of road construction and is hence able to speak with some authority upon this important matter.

The ideal pavement for all conditions has not yet been produced and probably never will be. On light-traffic streets, or those of mixed service, permanency is hardly so imperative as on heavily traveled streets, and the consideration of cost becomes more important. Here, also, the future growth or probable change from a district partly occupied by residences to one devoted entirely to business should receive careful consideration.

It is proposed to discuss here residence streets, boulevards and those serving suburban districts. The general character of the districts served may be considered fully well established, so no great changes in kind of traffic may be anticipated. The traffic on such streets is seldom what is probably termed "heavy," but may be "intense," that is, there may be a great many rapidly moving, comparatively light vehicles. Automobiles will predominate, with a lesser number of horse-drawn pleasure vehicles. At times, heavy teaming of building material, produce, coal, etc., must be provided for, and the general delivery and express service for the district.

To satisfy the requirements of such cases, a pavement must have many high qualities, and the standard is all the time growing higher, the public exacting and expecting better service. It must be reasonably permanent, moderate and flexible in cost, serviceable on all kinds of foundations, sanitary, smooth, dustless, noiseless, non-slippery, resilient, and agreeable to the eye in strong sunlight—quite a formidable list of virtues difficult to attain.

Examining the different kinds of pavements we will at once pass up many of them as possessing in an eminent degree only a few of the qualities named. Brick, concrete, stone block and wood block all possess some of these qualities but are lacking in others. Macadam cannot be classed as a permanent pavement, and we are thus reduced to some form of bituminous paving surface.

Sheet asphalt (sand asphalt) pavement is the best known and most widely used form of bituminous pavement—at least, it has been so for years past, though now other forms are becoming extensively known. Sheet asphalt must, however, be made comparatively thick, say 3 in., to conform to accepted standards; its cost is comparatively high, dependent on its thickness, though not in direct ratio thereto; it is suitable for use only on a concrete base; has a smooth, sheet-like surface more or less slippery; and last but not least has fallen somewhat into disrepute because of the skill and care required to produce a successful paving mixture and the constant effort during recent years to reduce its cost.

Asphalt block is a pavement that has been in existence for many years, but has not come into general use because of its high cost and difficulty of manufacture and transportation.

Macadam surfaces bonded by the application of bitumen in a liquid form have come largely into use during recent years, but have not established themselves as a standard type of pavement because lacking in the very essential quality of permanency under considerable traffic. Their place is on the country highway and roads of occasional traffic.

Having thus briefly reviewed the principal varieties of street pavement known and used in this country, we come to the one remaining general variety, designated as "bituminous concrete." Under this general name is included all paving mixtures consisting of broken stone combined with sand or other fine mineral matter, cemented together by a bituminous binder, which may be either tar as asphalt, making either "tar concrete" or "asphaltic concrete."

While both tar and asphalt are hydrocarbon compounds, their qualities are quite different. Tar, for practical use in a pavement, cannot have a melting point much higher than 130 deg. F., as it would become very hard and brittle in cold weather. In this climate it is not unusual to find temperatures of 115 deg. or even 120 deg. on the street surface, under which conditions a tar binder melting at less than 130 deg. would be almost liquid and have but little cementing or bonding value. In other words, tar, while quite adhesive and ductile, is very susceptible to changes of temperature. For these reasons it will not be considered further in this discussion.

The various asphalts that may be used in an asphaltic concrete have very different qualities and require different treatment, which will be briefly alluded to later.

For a paving mixture to merit the name of asphaltic concrete, the broken stone, according to a definition adopted by the American Society of Municipal Engineers, must be in sufficient quantity to form an important part of the mixture; also the ingredients must be combined and mixed before being laid. Neither the size of the stone nor the proportion of the various sizes in the mixture can be limited by the name "asphaltic concrete," any more than the size and proportions in a hydraulic concrete can be limited by the name. This can be done only by the specification of the particular mixture it is desired to produce.

Several varieties of asphaltic concrete are offered on the market under trade names, copyrighted or patented, that presumably conceal or but half reveal their somewhat mysterious qualities, such as "Bitulithic," "Amiesite," "Filbertine," "Warrenite," "Westrumite," etc. They are all asphaltic concretes founded on the old concrete idea of a broken stone aggregate supported and held together by a mortar matrix.

The first one named, "Bitulithic," is supported by letters patent in which the principle of filling the voids in the aggregate by the use of successively smaller sizes down to impalpable powder is exploited. It is claimed by this method of grading the sizes of the mineral that an "inherent stability" is produced in the pavement independent of the asphaltic binder, which then may be very soft and serve only to waterproof the mixture and to fill the remaining small percentage of voids.

Several patents have been issued to the originators of this pavement, the claims of which to the lay mind seem very similar, all of which rely upon this main idea of carefully grading the aggregate, and some of which describe carefully the process of separating the mineral into a number of sizes and recombining them according to a definite formula. This brings out the idea of "predetermining the sizes" of the mineral aggregate, which is a phrase met with in "Bitulithic" literature.

There is another claim in the "Bitulithic" patents that is an excellent one is carried out to its logical conclusion, that is, that by reason of filling voids so completely by grading the mineral the quantity of asphaltic binder may be reduced and the pavement "produced at a smaller cost." This is a quotation from the claims of the patent, and if produced at a smaller cost it naturally should be sold at a smaller price, thus justifying protection under the patent laws and earning the gratitude of the nation.

These references are made to the claims of the "Bitulithic" pavement, disregarding the other special asphaltic concrete pavements named above because the "Bitulithic" is the only one that endeavors so to broaden its claims as to monopolize the field of asphaltic concrete paving. If we sum up the claims of the "Bitulithic" patents, we find they hinge upon, and in fact are reiterations of, the principle of reducing voids by carefully graded sizes so that an "inherent stability" is produced and less bitumen used, thus reducing cost and increasing usefulness.

If it is true that "Bitulithic" methods are the best and cheapest, it becomes the duty of every engineer and city official to support them and use them. Let us examine the situation a little further and see what conclusions can be drawn on this point.

It cannot be contended that good "Bitulithic" pavements are not produced, for many excellent examples may be found throughout the country. At the same time many excellent examples may be found of sheet asphaltic pavements, and it cannot be contended there is any "inherent stability" in the sand of which they are composed. All the stability must be supplied by the asphaltic cement.

In 1907 a contract was let to the Bitulithic Company for about three miles of pavement on Michigan Ave. and South Park Ave. in Chicago, which was laid during 1907 and 1908. On these avenues there is but little heavy teaming, as they are boulevards and under usual boulevard restrictions as to traffic. In 1908 a traffic census showed from 3,000 to 5,000 vehicles per 24 hours on the three miles of pavement in question, which by 1912 had increased to from 5,000 to 12,000 per 24 hours—practically doubling the average number.

During the summer of 1909 some small portions of the surface began to show a tendency to form waves and ruts, but was scarcely noticed, being considered only local or accidental defects. It was not thought there could be anything very serious the matter; the spell of "inherent stability" was too strong.

By the summer of 1910 conditions were much worse, and the contractors put heavy rollers on to smooth out the waves and ruts, also attempting to roll into the surface, first limestone screenings, then granite chips, and, finally, crushed granite about ¾ in. in size.

These expedients one by one failed. The screenings, chips and crushed granite could not be forced very deeply into the surface and most of the particles were easily loosened and torn out again by the traffic. It was found that while the rollers smoothed out the surface it wouldn't stay smooth, but quickly formed ruts again as long as warm weather continued. By keeping the rollers going more or less all the time until cooler weather arrived, the streets were kept in fair condition for the winter, but early in the summer of 1911 the campaign had to be begun again.

This season it was prosecuted more vigorously. The crushed granite was coated with bitumen to make it bond more effectually into the body of the pavement.

The surface of the street was punctured full of small holes into which the coated stone was swept and then rolled. These efforts were all of doubtful and temporary value. Conditions all the time grew worse, and it is safe to estimate fully $20,000, or from 25 to 30c per sq. yd., was expended by the contractors during the three seasons named without materially improving the condition of the pavement.

In the summer of 1912, under strong pressure from the Park Board, the contractors abandoned their efforts to stiffen up the pavement and resurfaced the whole area with a layer of new asphaltic concrete about 1½ in. thick. The method followed was to go over it with surface heaters, softening up the surface until about an inch in thickness could be removed with rakes. Then the new 1½ in. layer of asphaltic concrete was spread and rolled, thus making it about ½ in. thicker than formerly. After this resurfacing the pavement was left in excellent condition at the end of the season of 1912 and so remains up to the present time.

It is to be noted the original pavement was specified to be at least 2 in. thick and actually averaged 2½ in. throughout a large portion of it; also that the original binder was tar. Thus the pavement is now composed of 1 to 1½ in. of tar concrete, overlaid with 1½ in. of asphaltic concrete.

In extenuation of the troubles on this particular pavement it may be pointed out that there are many excellent examples of "Bitulithic" pavement to be found. This is true. There is one other piece of "Bitulithic" pavement in Chicago, about one-half mile long, on Sheridan Road, which is as fine a piece of pavement as can be found, and it is older than the Michigan Ave. pavement. But it is from one failure like this that we can learn more than from numerous successes that teach nothing.

It may also be argued that the traffic on Michigan Avenue was extremely severe, or that if the original binder had been asphalt instead of tar the result would have been better.

This may be true, but it is not to the point. The main point is the very important "inherent stability" was not in the pavement to resist displacement independent of the support of the binder; and if it was there at all it was not sufficiently "inherent" to resist the severe traffic.

The traffic, while severe, was not prohibitive—was not sufficient to strain a good asphaltic concrete pavement be yond a safe limit. It was merely a severe test and developed a weakness that might have developed to a lesser degree or more slowly under lighter traffic.

In 1909 an asphaltic concrete pavement was laid on Michigan Avenue, between Twelfth St. and Jackson St., which in 1911 was carrying a traffic of 17,000 vehicles during 24 hours. This was not laid by the Bitulithic Company nor under their specifications, and was the subject of a suit between the Bitulithic Company and the South Park Commissioners, of which more will be said later.

No trouble has occurred with this pavement up to date except a comparatively small number of cracks which have in every case been traced to the concrete base. In explanation it should be said the street between these points is 75 and 85 ft. wide between curbs, having been widened 35 ft. to the eastward when paved in 1909. Thus a portion of the sub-foundation is new filled ground and a portion the old street, and the support is uneven. Also the construction of a number of large buildings on the west side of the street has caused settlement in places and consequent cracks in the pavement. This pavement is between the "Bitulithic" pavement and the center of the city and carries a larger traffic.

There were also asphaltic concrete pavements laid adjoining the "Bithulithic" on Michigan Ave. at 39th St., and on South Park Ave. at 35th St. They are on both avenues extensions of the "Bitulithic" to the southward and carry the same traffic in slightly decreasing numbers. No trouble has occurred with these pavements and they have cost nothing for repairs up to date except on two intersections where the cross traffic was quite severe and has occasioned minor repairs.

As stated above, neither "Bitulithic" methods nor formulas were followed. No special care was taken to grade the aggregate except to be sure there was plenty of mortar to fill voids and the fine material in the mortar was in proper proportions to give a well-filled mixture. Beyond this the success of the pavement depended on the proper preparation of the base and the use of a suitable asphaltic binder. Dependence was had on only common-senes methods to resist lateral displacement, and the paving mixture was intended to be waterproof for obvious reasons.

The heating and mixing were done in portable plants working on the street; the proportioning of the mineral ingredients was by wheelbarrow loads; and the prepared material was delivered quickly and directly on the street surface. Much of the success and moderate cost were doubtless due to the methods and machinery used. There was no overheating or chilling of material due to long hauls, no separation of ingredients from the same cause, and no bad work on account of delays either at the plant or on the street. The concentration of all operations in one place, under one superintendent, undoubtedly tended to better results in many ways.

The comparison of cost between the three sections of pavement referred to above is as follows:

The "Bitulithic" by contract cost $1.90 per sq. yd., exclusive of cost of base.

Asphaltic concrete by contract on Michigan Ave., between 12th and Jackson Sts., $1.73 per sq. yd., including concrete base, which would make it exclusive of base about $1.10 per sq. yd.

Asphaltic concrete laid by day labor on Michigan Ave., south of 39th St., and on South Park Ave., south of 35th St., less than 75c. per sq. yd., exclusive of base.

Following are the analyses of the mortar constituent (that is, 10-mesh material or less) of several samples of asphaltic concrete which have been under traffic for long enough periods of time to demonstrate their good or bad qualities. The first four proved to be very good, and the latter two indifferent in quality.

	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
	%	%	%	%	%	%
Bitumen	18.8	18.9	16.1	21.0	18.9	16.3
200-mesh	10.8	11.6	11.7	10.9	4.3	3.5
80-mesh	10.6	11.5	7.0	26.2	5.9	5.7
40-mesh	36.8	35.3	22.7	19.3	50.3	54.1
10-mesh	23.0	22.7	42.5	22.6	20.6	20.4
	100.0	100.0	100.0	100.0	100.0	100.0

As far as the coarse aggregate is concerned, that is, all material coarser than 10-mesh, there were considerable variations in the different samples, but the total quantity was approximately the same, and the variations seemed to have nothing to do with the success or failure of the sample. Samples 1 to 4 were successful, and they were rich in dust and reasonably well proportioned in other sizes up to 10-mesh. Samples 5 and 6 were practically failures, and they are seen to be lean in dust with an excess of 40-mesh material not well filled by the smaller sizes.

Here is where stability is found, or such "inherent stability" as belongs to the mineral aggregate of asphaltic concrete, not in the careful grading of the larger sizes. It would not matter if there was 25 or 50 per cent. of mineral larger than that passing a 10-mesh screen added to the mortars of samples 1 to 5; the result would have been the same. Nor would it matter if this 25 or 50 per cent. of coarse mineral was all of one exact size or of several carefully graded sizes; the pavements would have been good.

Therefore, in the making of good asphaltic concrete, it is an axiom that we must have a good mortar, well proportioned as to mineral, with a good asphaltic cement to bond it properly together. Having this, the coarse aggregate may be added with considerable freedom.

There are, of course, certain precautions that must be taken and certain useful refinements that may be attained, as in the making of other bituminous pavements. For instance, too much dust in a mixture will require more asphalt, etc. All such points could not be covered in such a discussion as this, but the principles stated above may be taken as fundamental.

There are on the market two general classes of asphalt binders, or asphaltic cements, as they are more properly called when of a character suitable for use in paving mixtures, distinguished generally from each other by the presence or absence of any considerable degrees of ductility.

Ductility is the quality that enables a substance to be drawn out like chewing gum without breaking. It is of no direct value in the paving industry, but is supposed to indicate other qualities of value, such as cohesion and adhesion. At the same time it indicates other objectionable qualities, such as susceptibility to changes of temperature. A considerable degree of ductility is required in most sheet asphalt specifications, but engineers conversant with the most successful practice in asphaltic concrete work agree that ductility is not an essential quality.

It may be conservatively said that good work can be done with either ductile or non-ductile asphalt, with simplicity of manipulation somewhat in favor of the non-ductile material.

These statements, however, are not intended to dispose of the question of which is the most durable under heavy traffic or to suggest that one class be chosen in all cases to the exclusion of the other.

Successful foundations may be made of either concrete or macadam. Where traffic is comparatively heavy, unquestionably the concrete base has the advantage of greater rigidity, more "inherent stability." On the other hand, macadam in some cases may be the more advantageous to use. It does not have to stand so long to set up before you can apply the wearing surface, consequently the street is not out of service so long, and if you are working over an old street, where there is some old macadam in a more or less worn-out condition, frequently considerable economy can be effected by using a macadam base. This is a question for the engineer to work out in each case.

One principle may be laid down to apply to either concrete or macadam base. Don't finish it up smooth, but leave the surface rough and grainy, so the paving material may be forced into the interstices. The specifications promulgated by the Association for Standardizing Paving Specifications go into the question of preparing the base pretty well. Up to date considerably over 1,000,000 sq. yds. of asphaltic concrete pavement has been laid in Chicago.

Building Activity at Fort William

The Kaministiquia Power Company, who already have 35,000 h.p. of hydro-electric developed, are contemplating an additional outlay of one million dollars in enlarging the present plant at Fort William. Acting under instructions from Mr. H. S. Holt, president of the Kaministiquia Power Co., Mr. R. S. Kelsch, the enginetr in charge of the Kaministiquia Power Company's plant has been making preliminary surveys between Fort William and Kakabeka Falls a distance of seventeen miles, putting camps in shape and so forth in anticipation of orders from headquarters to go ahead with the work. The contemplated additions will consist of either two units each of 5,000 h.p., or a single unit, of between 10,000 and 15,000 h.p., that will increase the total development of the hydro-electric power plant of this city to nearly 50,000 h.p.

The new terminal elevator being built for Fort William Elevator Company at West Fort William commonly known as the David Horn elevator is fast assuming a finished appearance. The building when completed will be one of the most modern and up-to-date grain handling plants on the Continent. The storage house consists of forty-eight round tanks and thirty-five interspace bins, ninety feet in height, with a capacity of 1,500,000 bushels. The work house portion contains thirty-two circular bins and sixteen outer-space bins with a capacity of 500,000 bushels, so that the total capacity of the elevator will be 2,000,000 bushels.

The special feature of the elevator is the drying plant to be used for the treatment of tough or damp wheat, 1,000 bushels of grain per hour can be put through the drying process without any difficulty. The big terminal elevator of the Dominion government with a capacity of 3,500,000 bushels is nearing completion and will be used to assist in handling this year's crop.

The Fort William Brass Foundry, which was recently destroyed by fire has been reorganized under the name of the Varlow Foundry Company, Liimted. The company have been issued corporation papers and are capitalized at $40,000. The new plant is already in operation with a staff of fifteen brass molders, with the promising outlook for this particular industry. The president and managing director of the concern predicts that within twelve months they will have at least fifty employees.

The contract for the construction of Fort William's new incinerator has been awarded to Mr. M. H. Braden. The cost of the incinerator will be in the neighborhood of $20,000 and will be of a metropolitan type. The site selected for the erection of the plant is in block "A" St. Paul addition. Messrs. The John Inglis Company were the successful tenderers for the construction material.

The Navigazione Generale Italiana and the Italia Steamship Company have just started a line between Italy and Canada. The service is at present a monthly one conducted with two ships, the Palermo and Napoli, which leave Genoa for Naples, Palermo, Halifax, and Boston. On the return journey the call at Palermo is omitted.

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Building Active—Fine Residences for Vancouver—Extensive Plans — Victoria Erecting Many New Structures

Correspondence of the Contract Record

A CAREFUL review of conditions in the building and constructional field at Vancouver and other important Coast points justifies the statement that in point of business blocks at present under construction there is little, if any, falling off in the number and value as compared with the corresponding period of last year. The fine weather of the last few weeks has enabled contractors to make excellent headway with many important buildings in the central business districts; and in the adjoining municipalities of Point Grey, South Vancouver and Burnaby, the activity in the construction of dwellings is even more pronounced than in the residential sections within the city boundaries.

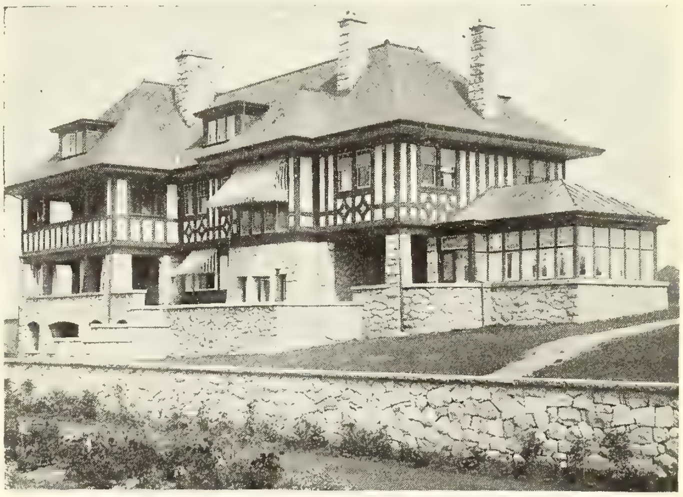
There is every prospect that present conditions, which are considered very satisfactory despite the tightness of money will continue steadily throughout the remaining months of the year, the quantity of work contemplated or already under way warranting the utmost confidence in the future.

A Typical Coast Residence

While it must be admitted that, like other western cities of meteoric growth, Vancouver and its suburbs are far from presenting the uniformity of appearance which exists in the older cities of the east, there is no denying the fact that of recent years a remarkable improvement has taken place in the quality of residences erected in the suburban districts of the rapidly expanding capital of British Columbia. Visitors from all parts are invariably impressed with the important phase of the city's development, and in this respect, it can be truthfully stated that the credit is almost entirely due to those members of the architectural profession of comparatively recent arrival. The illustration produced herewith shows a residence in the Vancouver Heights district, designed with the excellent taste displayed in large numbers of dwellings of the better class type situated in various parts of the city and adjoining municipalities. The materials used in the construction of the residence shown are stone to the first storey, and half timbers with plaster panels for the upper portion. A spacious basement partitioned off into storerooms, playrooms, etc., is provided. Hardwood flooring is used for the entrance hall, study and smoking room, dining-room and drawing-room on the ground floor. The dining-room is panelled in Australian mahogany and quartered oak is used as panelling in the entrance hall and corridor, the staircase, being also of this material. The panelling of the study and smoking room is in Yaka wood. Plaster cornice and enriched ceiling ribs contribute to the attractiveness of the drawing-room and corridor, while the ceilings of the dining-room, study and smoking room are beamed in woodwork to match the finish in each compartment. The first floor is occupied by six bedrooms, three bathrooms, with toilets, and a sleeping balcony. Three bedrooms, billiard room and bathroom are contained on the attic floor. All bedrooms are finished in plaster, with trimmings of B. C. fir, the latter material having been also utilized for the floors and corridors in the upper storeys. Mr. C. J. Peter is the owner of this handsome dwelling, which is situated on an eminence overlooking Burrard Inlet. Messrs. MacLure & Fox, of Vancouver, were the architects, and Mr. Geo. Calder, of Victoria, carried out the general contract.

Two New Vancouver Buildings

Vancouver is fortunate in possessing many architects who specialize in the designing of apartment blocks, and the example here shown is an excellent type of which numbers are constantly being erected in various parts of the city, chiefly in the west end. This building, known as the Colonial Apartments was designed by Mr. Kennerley Bryan and is situated in the 500 block, Burrard street. The measurements are 66 x 66 feet, and the height five storeys with full basement. The construction of the lower storeys consists of reinforced concrete and partial steel frame, the upper portion being composed of Dennison interlocking tile, while the exterior facing on all sides is red Alberta brick, with stone trimmings. The ground floor contains one large store and the main entrance to the apartments; the upper storeys being occupied by 28 suites of four rooms each. Both entrances have terrazzo tile flooring, and the main entrance hall is lined with marble. All interior woodwork is B.C. fir, finished in ivory white enamel; and the fittings of the apartments are modern in every respect. The equipment installed in the basement comprises a steam heating plant, vacuum cleaning outfit and electrical arrangements. The construction of this building which is estimated to cost approximately $80,000, is rapidly approaching completion. Mr. J. H. Vickers has charge of the general contract.



Residence of Mr. C. J. Peter, Vancouver Heights.

The accompanying photograph, showing the progress of construction on the new Yorkshire Building, Vancouver, serves as an illustration of the excellent type of structures which are constantly being erected in the central business sections of the city. This building occupies a space 50 x 120 feet and is of reinforced concrete construction with front exterior facing of terra cotta, selected pressed brick being utilized for the side and rear elevations. The entrance lobby will be treated in marble and tile, and marble will be used for the stairways and as wainscotting in the corridors. The floors of the banking rooms on the ground floor will be laid in tile with marble baseboards. The counters and office partitions will be of hardwood. The interior equipment throughout will compare favorably with the most elaborately planned buildings of this type in Western Canada. The Dominion Construction Company has charge of the contract. Messrs. Somervel & Putnam are the architects.

Colonial Apartments, Vancouver.

Many Substantial Structures Planned

A contract was recently awarded to Messrs. Baynes & Horie for a four storey building which is to be located at the corner of Cambie and Nelson streets, Vancouver. The proposed structure will occupy a ground floor area measuring 88 x 100 feet, and is to be of mill construction costing when complete about $150,000. The Mainland Ice & Cold Storage Company are the owners. Messrs. Gould & Woods prepared the plans. A three-storey apartment building is to be erected shortly in the 600 block Seventh avenue east, Vancouver, by Mr. R. J. Coleman from his own plans, to cost $60,000. The structure will be of brick on a concrete foundation, having galvanized iron cornice, tar and gravel roof, hot water heating, etc.

It is understood that plans for an eight-storey apartment building of reinforced concrete, brick and tile construction which is to be erected at English Bay for Messrs. Hampton & Edgar, Vancouver, will be completed before the end of August. The name of the architect is withheld for the present. The structure will occupy a lot 132 x 90 feet, and although few constructional details are available at this date, it is announced by the owners that no expense will be spared to make the building one of the best of its type in Vancouver. Construction is to commence very shortly on a two-storey brick and veneer hotel building at Port Coquitlam which is to be erected for the Coquitlam Terminal Company, after plans by Messrs. Parr, Mackenzie & Day, Vancouver. The building will be replete with modern innovations throughout, and will be built at an expenditure of upwards of $60,000.

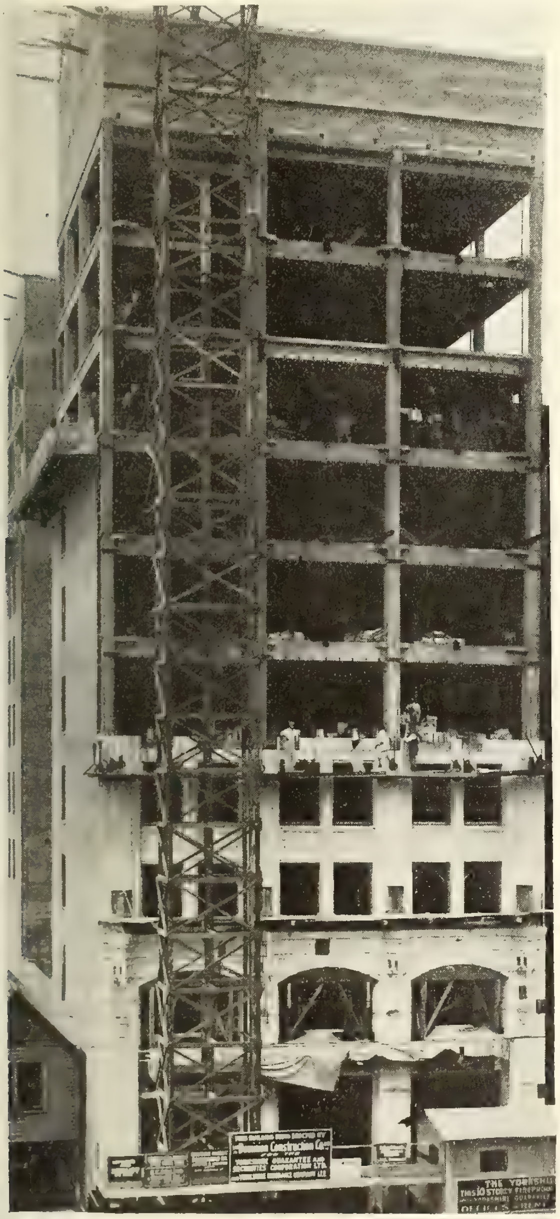
A building permit was issued recently at Vancouver for the construction of a three-storey and basement, brick warehouse building on the corner of Homer and Davie streets. The ground floor of the structure measures 119 x 200 feet and the specifications include granite window sills, tar and gravel roof, galvanized iron cornice, fireproof doors, etc. Work is to commence without delay. Messrs. Sharpe & Thompson are the architects. The cost will be about $70,000. The same architects have completed plans and closed general contract tenders for the erection of a reinforced concrete garage building on Georgia street, Vancouver. This building will be two storeys high and will measure 60 x 80 feet. Terra cotta will be used as exterior facing on the front elevation, and the remaining elevations will be faced with pressed brick. It is expected that construction will be started in the course of the next few weeks.

It is reported at the Coast that the Department of Public Works, Ottawa, has practically completed plans for the proposed new immigration sheds which will be erected by the Dominion government in this city, and that in all probability tenders for the work will be invited very shortly. The proposed buildings are to be of reinforced concrete and brick construction, and will cost approximately $250,000. Excavation work is well under way on the site of a new reinforced concrete garage building which is being erected on Seymour street, near Smythe street, Vancouver, for the North-West Trust Company. The structure will measure 50 x 120 feet, and will be two storeys in height, the cost when completed being estimated at approximately $30,000. The specifications call for a concrete building throughout with exterior facing of pressed brick. Campbell Bros. have charge of the excavating, and the Dominion Construction Company have been awarded the general contract. Mr. W. F. Gardiner is the architect. Plans have been approved by the Vancouver building inspector for two brick buildings which are to be erected by the Salvation Army officials at the corner of Seventh Avenue and Quebec street, and at Lansdown avenue and Quebec street. Both buildings will be three storeys, of brick and mill construction, and have been designed by Mr. J. W. Spence who will also handle the general contract. The building at the first location mentioned is estimated to cost about $30,000, while the outlay on the second structure is not expected to exceed $20,000. Work on both structures will probably commence some time in August.

Tenders for the erection of a handsome residence for Mr. Robert Kelly in Shaughnessy Heights, Vancouver, were closed recently and actual construction work is expected to commence immediately. The building is planned along the lines of an Italian Villa, the design providing for brick and stucco construction with tiled roof. The interior of the main floor will be finished in mahogany and quarter-sawed oak. Specifications call for hot-water heating, modern plumbing, and heating, and all modern equipment. Mr. R. A. Nicolais is the architect for this residence, which is estimated to cost fully $35,000. Plans are now being prepared by Mr. R. A. Nicolais, Vancouver, for a splendid residence to be located at Eburne, in the adjoining municipality of Point Grey. The building will be two storeys and full basement, with stone and stucco exterior. A garage and stables will be erected in connection, also a large greenhouse in the basement of which will be situated the boiler room for the heating system to be used throughout the establishment. Contract tenders will be called for at the end of August.

VICTORIA STILL FORGING AHEAD

Plans for a new theatre which is to be built for Mr. Alex Pantages, head of the Pantages vaudeville circuit, are in course of preparation by Mr. J. M. Warren, the well-known Victoria architect. According to the limited information at hand the structure will be located on Government street, between Cormorant and Fishguard streets, Victoria, and is being designed along the lines usually adopted for up-to-date theatre buildings of this class. An exceedingly ornamental front is to be provided and the specifications will call for class "B" construction, brick and steel. The building will accommodate 1,000 persons. Modern methods of steam heating, ventilation and lighting will be employed and the total outlay is expected to reach approximately $125,000. Excavating operations are now proceeding on the site and the actual work of construction will be commenced at an early date.



Yorkshire Building, Vancouver.

The provincial government has decided to use stone instead of terra cotta in the construction of the new Provincial Normal School at Victoria, and a contract covering all the stone required for the structure has been awarded to Messrs. Whitworth & Stewart, of Vancouver. The stone will be obtained from the quarries of the Denman Island Stone Company, and will be used wherever the original specifications called for terra cotta. It is understood that the change in materials was made to give employment to local tradesmen. The contract for the new Normal School which was recently awarded to Luney Bros., of Victoria, calls for an expenditure of approximately $300,000.

Mr. H. Bryant Newbold, a busy Victoria architect, is designing a hotel building to be erected at Sidney, to cost about $20,000. Among other works which Mr. Newbold now has under way is a residence to be erected at Alta Dena for Mr. E. Kennedy, to cost approximately $10,000, six residences for Sidney and one for Union Bay district, and a 54-suite apartment building to be erected in Victoria shortly for a local syndicate.

An immediate start has been planned for the construction of a new hotel building to replace the present structure occupied by Murphy's Cafe, Victoria. The plans prepared by Mr. J. M. Warren provide for the construction of an eight-storey building with a frontage of 25 feet and a depth of 75 feet, but for the present the structure will be six storeys in height only. Reinforced concrete and fireproof construction will be adopted throughout. The ground floor will be occupied by office, buffet and other departments, and on the upper floors will be bedrooms with private bathrooms, telephones and all modern accessories of an up-to-date hotel. In the basement will be located a large grill. The exterior of the building will be faced with pressed brick and terra cotta trimmings. Steam heat will be installed throughout. An expenditure of $50,000 has been estimated for this contract. A permit was issued recently in Victoria for a three-storey apartment building which will occupy a site at the corner of Linden avenue and Fairfield road. The type of construction chosen is reinforced concrete. The building will contain altogether twenty-one apartments of two and three rooms each. Mr. A. McCrimmon is the contractor. The cost will be approximately $42,000.

The B. C. Granitoid Company, Vancouver, has been awarded a contract for the erection of a two-storey reinforced concrete warehouse building at the corner of Store and Telegraph streets, Victoria, for the Swift Canadian Company. The actual construction contract will represent an outlay of approximately $55,000, apart from the cost of equipment which is expected to estimate as high as $100,000.

The contract for the new public building which the Dominion government will erect in Duncan, Vancouver Island, was recently awarded to Messrs. Rourke, McDonald & Moncrieff, Vancouver. The building will be of brick construction, two storeys in height and has been planned along the usual lines of such structures. The contract price is approximately $39,000.

Actual work has been undertaken on the Prince Rupert drydock buildings by the Wineland Construction Company, Vancouver, general contractors. The work includes the power house, 104 x 108 feet, with steel frame chimney of fireproof construction, 11 ft. in diameter, and 200 ft. in height. A shipbuilding shed, 160 x 300 feet, with 10-ton travelling crane; boiler and blacksmith shop, 76 x 150 feet, with concrete flooring; 15-ton travelling crane; six 400-h.p. water tube boilers; a machine shop, 76 x 150 feet, with complete equipment of tools.

The West Kootenay Light & Power Company has awarded a contract for an 8,000 h.p. water wheel to the Allis-Chalmers Company, and an 8,000 h.p. generator to the Canadian General Electric Company to provide additional power at the company's power plant at Bonnington Falls, near Nelson, B.C. This will give 25,000 horse-power at the upper plant, and 3,000 h.p. at the lower plant, as well as 3,000 h.p. at the Cascade additions. It involves an expenditure of $130,000 made necessary by the constantly increasing load of the Rossland mines and the Trail Consolidated smelter.

It is announced that plans will be completed before the end of August for the proposed government piers adjoining the breakwater at Victoria, and the general contract tenders will be invited without delay. This work involves two piers, of solid concrete construction, each 1,000 feet in length and the probable cost is about $1,000,000.

The following officers of the British Columbia Society of Architects were elected for the ensuing year at a recent meeting of that body held in Vancouver: President, Mr. Hoult Horton, Victoria; vice-president, Mr. J. L. Putnam, Vancouver; secretary, Mr. N. E. Read, Victoria; treasurer, Mr. P. L. James, Victoria; executive council, Messrs. Horel, Dodd, Hope, Thompson, Birkenhead (of Vancouver), Messrs. Cullen, Wilson, Jameson, R. Wilson and Keith (of Victoria).

From the Saskatchewan Capital

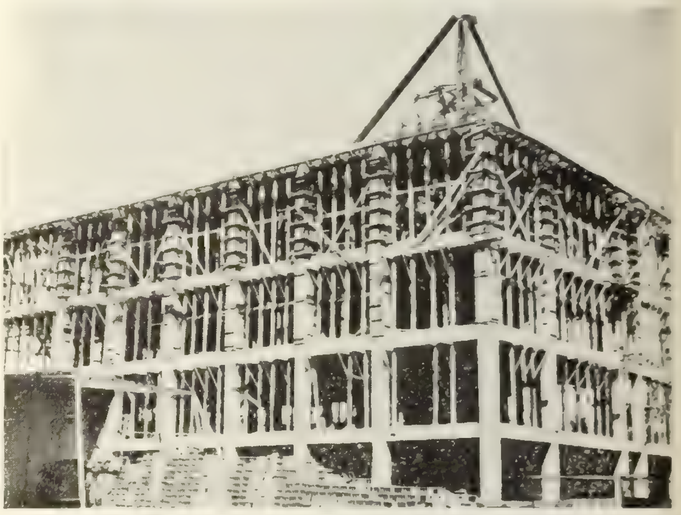
Correspondence of the Contract Record

In spite of the financial stringency, which seems to be Dominion-wide, there is an optimistic note in the construction world in this city, and all trades seem to be busy, with prospects that there will be enough work for all during the coming winter. The prospects are now that the bricklayers strike will be settled shortly, and that the Builders' Exchange will be on the way towards reaching an agreement with the union throughout the province. Conditions as to labor continue quiet, with enough men to fill the demands of the building in progress. There are under construction in this city several large buildings which will necessitate large numbers of all trades during the winter months, and the contractors are hastening the construction so as to have the buildings all enclosed when the first cold weather arrives. The city finances seem to be in as healthy condition as could be expected, practically all expenditures are well within the available cash, and the condition of the city finances reflects a healthy tone throughout contracting circles.

Building Operations

Rapid progress has been made on the half-million dollar Dominion Customs warehouse, the contractors, J. McDiarmid & Company, Limited, of Winnipeg, having the foundations placed and the structural steel well under way. In the erection 1,450 tons of steel will be supplied, fabricated by the Manitoba Bridge & Iron Works, Limited. Jones & Lyttle, Ltd., of Calgary, the contractors for the superstructure of the ten-storey Lancaster Building, have completed the placing of the concrete fireproofing and floors for the first five storeys and are making rapid progress towards its completion. The same contractors have recently completed the warehouse for the Cockshutt Plow Company, Limited, one of the largest and finest appearing commercial structures in the city. The architects are Lawson & Fordyce, of Calgary. Fyshe, McNeill, Martin, Trainer, Limited, have about completed the four-storey reinforced concrete warehouse for the Northern Electric & Manufacturing Company, Limited, and are making favorable progress on their other contracts, including the ten-storey office building for the Herald Publishing Company, Limited, and the store for the Calgary Furniture Store, Limited. The same contractors conducted their first annual picnic to Banff, in the Rocky Mountains, recently, and gave a free outing to over 260 employees and friends.

Although the amount of building permits has not approached the volume for the year 1912, still, there is a very appreciable amount of new work under way. Permits for the past month of July amounted to $1,164,600, making the total for the first seven months of the year $4,484,500, a decrease of 43 per cent. over the same period of 1912. Nevertheless, there is no anxiety displayed here, not even the most optimistic "boomer" of Calgary could expect the record of 1912 to be duplicated in a city the size of Calgary, let alone exceed it. The building of a number of moving picture theatres commenced here recently, the largest among them being that for the Canadian Film Exchange, Limited, on Eighth avenue, a building having a frontage of 50 feet in the heart of the business district. The construction will be entirely of reinforced concrete, the two-way Floordome System recently placed on the market by the Trussed Concrete Steel Company, being used for the first time in this city. The building is being constructed for the owners by day work, the architect being James C. Teague, of Calgary. Among the new work about to be commenced is a large reinforced concrete warehouse for the Canadian Consolidated Rubber Company, Limited, to be built by the Canadian Stewart Company, Limited, of Montreal and Chicago. The same contractors have under way an addition to the malting plant of the Canada Malting Company, Limited, of Toronto, which will practically double the capacity of the plant built last year. The malt house is already being increased and the excavation has been made for the addition to the grain elevators. The contract for the Pilkington Bros., Limited, warehouse has been let to Carter-Halls-Aldinger Company, Limited, of Winnipeg, and work will be commenced shortly. The architects are Hodson, Bates & Beattie, of Calgary.



Northwest Travellers' Association Building.

P. Lyall & Sons Construction Company, Limited, have the contract for the new building for the Northwest Commercial Travellers' Association, and have recently completed the placing of all reinforced concrete, involving a total of 875 cubic yards of concrete and 75 tons of reinforcing steel. The Kahn System of Reinforced Concrete was used. The building will be 60 ft. by 100 ft., and will be only four storeys high at present, though provision has been made in the design for an additional two storeys. The exterior will be of red pressed brick with Ohio sandstone trimmings, though the entire ground floor will be finished with the cut stone. The interior finish will be B.C. fir, and all floors will be finished concrete, these having the heaviest wear, as corridor floors, being finished with Master Builders' Method surface. There will be one Turnbull electric elevator installed at present, with provision for the addition of another when the building is enlarged. The building will be heated by a vacuum steam system, requiring one 80 h.p. Leonard boiler. This will be the first large building to have positive ventilation of all rooms and corridors according to the new city by-law to that effect. All rooms will have false, registered, ceilings, connected to a large vent shaft in the corridors which in turn leads to a vertical shaft in the rear of the building, the draft being induced by the presence in this shaft of the smoke-stack from the heating system. The ground floor will be devoted to stores and to sample rooms for the use of members of the association; two of the upper floors to offices, also for members; while the top floor will contain a club-room, billiard room, rooms for cards and reading, and a large banquet hall with kitchen and service attached. In the basement will be the heating system, and elevator machinery, besides a pool room, and other sample rooms. There will be a party light well on the north side. Another feature of the building will be the enclosed fire escape with indirect access. The total cost will be about $100,000. The architects are Burroughs & Richards, of Calgary.

Police Headquarters

Work has been commenced on the new Police Headquarters Building for the city of Calgary, the general contractors being Messrs. Thomas, Jamison & McKenzie, Limited, of Calgary. The general contract is for $103,000, other contracts to be let for the police cells, elevators, electric wiring, and plumbing and heating. The building will be very complete of its kind. The building will be 94 ft. 1 in. deep, with a frontage of 76 ft. on Seventh Avenue East, immediately in the rear of the present City Hall, and will be four storeys high. The frame of the structure will be reinforced concrete, the Kahn System to be used, and the exterior will be of red pressed brick with cut stone trimmings. The walls of the light court over the diffuser sash for the police court will be of white hollow brick. The interior trim will be of white oak, with partitions of 4 in. terra cotta blocks. Steel sash will be used on alleyways and light courts. The architects are Lang & Major, of Calgary. Mr. W. W. Hay, formerly secretary of the local Builders' Exchange, has been appointed supervising engineer for the city.

Railway Construction

Conclusive evidence of the real entrance of the Grand Trunk Pacific Railway and, to a lesser extent, of the Canadian Northern Railway, into this city is to be found in the city limits. The C. N. R. have about completed their grading into the city, and their contractors have placed the concrete for all the structures along their right of way except actual terminal buildings. There will be a six-span bridge crossing the Bow river in East Calgary, just to the south of the crossings of the C. P. R. and of the G. T. P. lines. The piers and abutments for this bridge are ready, and the arrival of steel will enable it to be completed. Within the city limits there will be an overhead crossing of the McLeod trail, and in the heart of the city there will be a subway at Second street, east. At the head of First street west there have just been completed the piers and abutments for a three-span bridge crossing the Elbow river, at the terminus of the line into Calgary. This is the last concrete to be placed for permanent way on a contract held by F. Ferhenbach & Company, Limited, of Calgary, covering the 30 miles to the north of Calgary. The G. T. P. has laid the steel up to the site of the barracks of the Northwest Mounted Police, and have a large number of teams grading the site of what is expected will be their Calgary terminal. The entrance into the city necessitated the erection of a two-span bridge in east Calgary, crossing the Bow river. The type of bridge is seen from the cut, being a single track, 9-panel, bridge, with equal spans of 157 ft. 6 in., with a short plate girder approach span on the east side of the river. A three-span plate girder bridge crosses the Elbow river at its junction with the Bow river, just east of the terminus of the line. The Calgary-Tofield branch of the G. T. P., as the line is known officially, will undoubtedly operate a limited service by the end of the month. The railway officials of both lines have observed extreme reticence in the matter of giving out definite information as to the plans of their final terminal in this city, so that a change in plans would not be surprising. The G. T. P.., at least, has laid steel and are grading a site for some terminal arrangement, whether it be final or not.

G. T. P. Bridge, East Calgary.

The factor determining the size and power of large locomotives is the physical endurance of the fireman. An ordinary fireman cannot put into the firebox more than from five to six thousand pounds of coal an hour. This is one of the considerations which render compounding and superheating, which under favorable conditions secure as much as 40 per cent. economy, such valuable factors in the development of the locomotive.

The Army airship Delta, the longest of the three in possession of the military wing of the Royal Flying Corps, made its record flight recently. It covered nearly two hundred miles in between four and five hours. Leaving Aldershot, it sailed south and passed Winchester. It returned over Guildford and made a good landing at Farnborough.

Third International Road Congress, London, 1913

By Arthur H. Blanchard, M. Am. Soc. C. E., Professor of Highway Engineering, Columbia University and Consulting Engineer, New York City

"Stop, Look and Listen," the characteristic sign which attracts the attention of the traveller at crossings of highways and railways throughout the United States, contains advice of inestimable value to those interested in the development of highways. As a pertinent citation of its application, the work of the Third International Road Congress is worthy of careful study in order that the mass of information collated through the medium of reports, discussions, conclusions and exhibitions may be drawn upon to furnish ideas which may be used in the development of highway engineering in this country.

First Congress

To-day the world appreciates the admirable work instituted by the French Government in 1908, through the medium of its famous Department of Roads and Bridges in calling to Paris highway engineers and officials from all over the globe for the purpose of mutual exchange of opinions pertaining to the administration, construction, and maintenance of highways. At this convention, the First International Road Congress, steps were taken to form the Permanent International Association of Road Congresses.

Membership

The Association includes in its membership national governments, state governments, municipalities, associations and societies, companies manufacturing materials and machinery, and individual members. According to the 1913 report of the executive committee of the association the membership on May 31st included 32 national governments, 256 corporate bodies and 944 private members. The dues of these members for the year ending May 31, 1913, was $21,520; of which $14,980 was subscribed by national governments.

Of particular interest to the citizens of the United States are the regulations relative to the affiliation of national governments. The pertinent portions of the regulations pertaining to the two controlling bodies of the Association, the Permanent International Commission and the Permanent Council, are as follows:

"The Permanent International Commission is composed of members belonging to the various countries represented in the Association. Each country has the right to one representative for each $200 of its total annual subsidy. Provided, however, that the number of representatives from any one country shall not exceed fifteen and that any country which pays not less than $50 shall have the right to appoint one delegate.

"The Permanent Council is composed of representatives chosen from among the members of the Permanent Commission: one for each country whose annual subsidy does not exceed $100; two for each country whose annual subsidy exceeds this amount, and is less than $2,000; three for each country whose annual subsidy exceeds $2,000."

It is unfortunate that our national government stands alone among the great governments of the world in not having affiliated with the Permanent International Association. Our neighbors, Cuba and Mexico, are among those who have lead us in officially expressing the interest of their national governments in the improvement of highways.

Since 1908 the subject of affiliation has been under consideration in the United States and since the Second International Road Congress held in Brussels in 1910 an active campaign has been waged to secure the adherence of the United States. In order that the United States may take its proper and dignified place in the world progressive movement conducted under the association it appears the duty of every association interested in good roads to pass resolutions memorializing the congress of the United States to take the necessary steps to become a member of the Permanent International Association of Road Congresses.

Future Meetings

During the sessions of the Third International Road Congress held in London in June, 1913, it was decided to accept the invitation extended by the German government to hold the 1916 congress in Munich. Since the Brussels congress there has been a tacit understanding that the fifth international congress should be held in the United States in 1919. It is, of course, obvious that unless the United States becomes a member prior to 1916, it will be practically impossible to carry out this very desirable programme, desirable not only from the standpoint of the citizens of the United States, but also from the standpoint of highway engineers and officials in all the countries of the world.

Organization

A brief outline of the scheme upon which is founded the work of an international road congress will give some idea of the large amount of available information relative to every phase of highway engineering which is disseminated among highway engineers and officials throughout every land. The Permanent International Commission about two years in advance of a congress meeting decides upon a series of topics which it considers of vital importance and upon which a large amount of investigative work is in progress. Another series of topics is selected pertaining to subjects upon which thought has not crystallized as definitely as in the case of the first set of subjects but information in regard to which will serve as the basis for future concentrated and co-operative work. The first set of topics is defined as questions, the second set as communications. The executive committee of the association then notifies the national representatives in various countries of the list of questions and communications and requests that in each country a reporter or a group of reporters be designated to prepare a comprehensive review on each question and upon each communication, the view point in each case being national. The reports are delivered to the executive committee some six to nine months prior to the meeting of a congress, are printed in the three official languages of the association, English, French and German, and distributed before the opening of the congress to all members of the association. In the country in which a given congress is held general reporters on each question are appointed to review all reports submitted, to summarize the practice indicated and to draft a set of conclusions which represent the majority opinion relative to various essential phases of each subject. These general reports are supposed to be distributed prior to the meeting of a congress. The

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* Paper presented before the convention of the North Carolina Good Roads Association at Morehead City, N. C., Aug. 1, 1913.

business sessions of the various sections of a congress are devoted to a consideration of the conclusions submitted by the general reporters. Naturally many amendments are proposed before the conclusions are finally adopted by the section particularly interested in a given subject. The conclusions as reported by the various sections are submitted at the final general meeting of a congress where they are considered for final adoption. The discussions, conclusions, general work of the congress, and description of the excursions, entertainments and the exhibition are published as the proceedings of the congress.

At the Third International Congress a total of 140 reports was presented by reporters from nineteen national governments, nine questions and ten communications composing the programme. Nine general reports by British engineers were prepared relative to the questions. The meetings of the third congress were well attended, the total attendance being between 2,500 and 3,000. The congress was so conducted that the proceedings of the various sessions, although carried on in the three official languages of the congress, English, French and German, were interesting and instructive. By having present expert interpreters, those in attendance were made acquainted with the remarks of members from all countries without any material delay in the progress of the meetings.

The exhibition was divided into four divisions: road materials and machinery; traffic; models, maps, drawings, and publications; and historical data. The first division comprised 42 exhibits of the principal types of materials and machinery employed in Great Britain and on the Continent.

The practical influence of the congress on the development of administration and organization of highway departments and the improvement of roads and pavements will depend to a marked degree upon the extent of the adoption of the principles and recommendations contained in the conclusions of the congress. The conclusions, although expressing in many instances the fundamentals of modern highway engineering practice, nevertheless will repay careful digestion by every American interested in good roads. Unfortunately American engineers and highway officials have not universally adopted many of the fundamental principles laid down at the International Road Congresses. Among the 83 conclusions adopted at the third congress, which are of especial interest to those having charge of highway work in the United States, are the following:

1st Question—Planning of New Streets and Roads

"As a general principle, it is better that new main roads be constructed to pass outside rather than through towns, and that, where an existing main road passing through a town is unsatisfactory for through traffic, it is often better in preference to widening an existing narrow main road through the centre of a town, new roads should be planned according to the principles of the science of town planning.

2nd Question—Types of Surfacing to be Adopted on Bridges, Viaducts, Etc.

"On short bridges in town or country, it is desirable that the surfacing should be the same as that on the adjoining streets or roads.

3rd Question—Construction of Macadamized Roads Bound With Bituminous (including Tarry and Asphaltic) Materials

"Confirming the conclusions adopted in 1910 by the 2nd congress (Brussels, 2 Question), which called attention to the advantages of a dry foundation and a sound subsoil, the congress especially insists upon the great importance of efficient foundations in the case of road crusts bound with bituminous (including tarry or asphaltic) binders for the following reasons:—

The road crust being expensive, it is important to give it a base which will increase its life.

As the weight, speed and intensity of the traffic continually tend to increase on roads considered worthy of such a crust, it is best to provide a foundation which has been so constructed as to secure for the crust the best possible conditions of resistance to wear.

"It is agreed that it is absolutely necessary to carry out repairs, in the case of all bituminous (including tarry and asphaltic) road crusts, immediately the necessity for them arises.

"The complete renewal rendered necessary by wear must be carried out immediately the depth of the road crust is below a given limit of safety, or when its waterproofing qualities have become so poor that the road will unduly suffer from climatic conditions.

"In the mixing method the stone must always be dry, and if necessary it must be heated.

"One must never employ road rollers which are too heavy.

"Sufficient information is now available to enable engineers to select and specify bituminous binders which will have no prejudicial effect upon public health, fish life, or vegetation; but which, on the contrary, will conduce to conditions of considerable hygienic advantage.

4th Question—Wood Paving

"Hard woods give varying results according to local circumstances, and it does not appear desirable to recommend them for roads with intense traffic in large cities, unless some means are devised to effectively prevent the rapid destruction of the joints and the resulting destructive effect on the concrete below.

5th Question—Methods of Lighting

"Every vehicle whether standing or moving should carry or show a light of sufficient power at night which can, except when specially authorized, be seen from the rear as well as from the front of the vehicle.

"Every motor car must carry after nightfall, two lighted lamps in front, and one at the back; if it is able to move at a high speed it must be fitted in front with a headlight of sufficient illuminating power to light up the road or path for at least 50 yards to the front. In inhabited places where the ordinary lighting is sufficient to allow motorists to see their way and to be easily seen, the light of the headlights must be limited to that of the ordinary lamp.

"One and the same colour should be universally adopted as the colour for danger signals.

"It is desirable that each government should do away as soon as possible with coloured lights on automobiles.

7th Question—Regulations for Fast and Slow Traffic on Roads

"That all regulations for the control of road traffic should be based on the principle of allowing the speed practicable for each different kind of vehicle consistent with public safety, general convenience, and the normal wear of the road.

8th Question—Authorities in Charge of the Construction and Maintenance of Roads. Functions of Central Authorities and Local Authorities

"A principle that can be laid down as of universal application is, that the unit of highway administration shall be sufficiently large and command sufficient resources to employ and adequately remunerate a competent staff.

9th Question—Finance of the Construction and Upkeep of Roads. Provision of Revenues

"The expenditure on the maintenance and improvement of roads which are used mainly by long distance traffic; unless such expenditure is borne wholly out of the national revenues under a system of state administration of roads (which system is practicable and suitable in the case of some roads in some countries) should be mainly paid for out of national revenues, whether or not such roads are locally administered and maintained, subject, where local administration prevails, to the supervision of a central government authority both as to efficiency and expenditure.

"It is desirable to abolish, so far as possible, all tolls on public roads, but it is equitable that vehicles which, on account of their weight or weight combined with speed or any other exceptional circumstances connected with either the vehicle or use of the road, cause special damage to roads beyond the wear and tear of the ordinary traffic of any district, should be subject to special taxation, the proceeds of which should be earmarked for expenditure on roads.

"Borrowing money for new road construction and for the periodic renewal of the surface coating of a road is consistent with sound financial principles provided that the loan period in the case of loans for renewals, is kept well within the life of the surface coating."

Even a brief summary of the work of the Third International Road Congress should not be closed without reference to the hospitality and elaborate series of entertainments and excursions provided by our British cousins and the officials of the Permanent International Association of Road Congresses.

Civic Development*

By His Worship, Mayor Short, Edmonton

This is a problem which may be looked at from various points of view. First, there is the merely physical growth, the adding of house to house, street to street, industry to industry. Second the exercise and increase of the powers of local self government; third the administration of the city's affairs, and the systematizing and perfecting the machinery for that purpose. I should prefer to confine myself to the two latter.

The Townsite

To begin with, we should ask the government to provide that no townsite shall be laid out or extended upon land not reasonably suitable for the purpose, and not then, unless a reasonable water supply and drainage facilities are possible. Throughout Western Canada townsites have been laid out, often with little or no regard to the fitness of the site itself, or to the possibility of securing these advantages. What is done may not be mended. There is still nearly half of the four great Western Provinces to be taken care of, and let us ask government to do so. Persons putting townsites on the market should be first required to provide therein water, sewer and pavements, for these are absolute necessities of civic life. The enormous unearned increment that has been swept away from our citizens in the past ten years by the exploitation of townsites were quite large enough to have provided these improvements.

Provision for Streets

Again, there should be provided streets not less than 80 ft. and lanes not less than 20 ft., the latter to carry sewer, water, gas, light, telephone or other wires and these should be laid out in harmonious relation to each other, and there should be radials capable of extension, so that it would be possible to get to all points of the compass readily from a common centre.

There should also be boulevards, wider than ordinary streets so as to permit of buildings of a public or semi-public character located to form a view calculated to impress.

There should be parks and breathing grounds for rest or recreation scattered regularly throughout the townsite. All places of special scenic beauty, such as the banks of a river or a ravine with boulevards skirting the same, should be dedicated to the public use. Broken ground or such places as only with difficulty and great expense could be rendered amenable to general civic purposes, should be likewise retained for parks. It certainly seems unfortunate that lands entailing expense for fitting up far beyond their intrinsic value should be allowed to be utilized for townsite purposes. Provision should also be made that certain classes of buildings and business should in a general way be kept each in its own location.

Administration

Turning from this more purely physical point of view, one meets the more difficult problem of administration. This is the difficulty of getting trained men. The problem is that of the man. Whether the final executive control is placed in the hands of a Board of Commissioners, a Board of Control, a Burgomaster, or an executive head under any other name, the problem is pretty much the same. Separate your activities into departments. Chart the duties of all who are required to administer the work, but above all, get a good managing head for the department. It is easy to get men who will carry out work, but hard to get those who will carry it out efficiently and with economy.

Far too little do city authorities realize that they are spending trust moneys. Far too much do they assume that money and economy are last to be thought of. Having thoroughly organized, having chosen heads who have demonstrated their integrity and managing ability, let us then provide for a thorough audit of all expenditures; not by an auditor who is the equivalent of a girl with a comptrometer, but by a real auditor who gets to the bottom of every expenditure and the why and wherefore. As his complement, let us appoint an efficiency officer whose duty it will be, not only to see that the work done is such that should be done, and that it is done in the right way, but also that we get a hundred cents worth for every dollar we spend. Let us standardize the method of keeping accounts, and of doing work, then let us ask the government to establish a local government board with general supervision over the activities of all cities and towns whose special duty it shall be to see that our standardization is made effective.

Local Self Government

Turning again to the government side, one finds a new problem. Local self government, is the legislative problem of to-day. A few years ago powers were dealt out to cities, towns and villages by schedule and only those on the list could be exercised. From year to year new needs arose. Demand was made and grudgingly powers were widened. Today there is a letting down of the barrier and it is beginning to be realized that civic government embraces wider fields than were dreamed of a few years ago. In the Edmonton Charter, which in itself is a departure, the powers of the city were defined as being to make laws for "the peace, order, good government and welfare" of the city. In effect these are the words of authority given to the Dominion Government. The difference in exercise of the powers is merely in the scope wherein they are to be exercised. Under them it is our privilege to grow, to develop in succeeding years. That which seems beyond the powers of the city will with growing public opinion become entirely proper a few years hence. What Canadian city twenty years ago would have thought of installing and operating water, light, telephone, street railway system, or providing a prison farm for the weak and neglected? Yet within that time these powers have been granted and acted upon, and that action is looked upon as a reasonable and proper exercise of municipal authority. The people themelves, upon the ground, conscious of their need, can when charged with the duty, more readily evolve rules and regulations to meet the case, than can a parliamentary body hundreds of thousands of miles away.

How then shall we justify this broadening of powers of local self government? Let us undertake no activity that is not clearly within the scope of municipal adventure. Let us obtain the right kind of men to administer the powers and responsibilities. Here there is need of educating the public. Too much our best men reserve their activities for the wider fields of Dominion and provincial affairs. Too little they give attention to the possibilities of local self government. Let us set to work to get out our best men.

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* Before the Union of Canadian Municipalities, Saskatoon, July, 1913.

Conclusion

How then are we to obtain a betterment? Will increasing the powers of a city increase the capacity of its representatives? Experience does not seem to lend color to that view, still men strive to be representatives of a class or clique and still the more experienced and more capable business men are unwilling to face the campaign often of personality and misrepresentation. Until we change that civic development will not come to its own. There is no system of government which is perfect. The best in the world will fall down in the hands of incapable and irresponsible persons. On the other hand a crude and unscientific system in the hands of good men will yield good results. One conclusion seems inevitable, and that is, that bureaucratic government is just as dangerous to-day as it ever was, and that no system should be adopted which takes out of the hands of the people and their elected representatives the ultimate authority.

Important Road Congress

The joint committee having the matter in charge decided to hold the American Road Congress at Detroit during the week of September 29. This will mean the greatest road assemblage ever held in the United States as the Congress comprises the American Highway Association, with upwards of 2,000 regular members and more than 15,000 associate members; the American Automobile Association, with over 70,000 members; the Michigan State Good Roads Association which is strongly organized in every part of the state, and in addition to this it is quite probable that the Ontario Good Roads Association will join with the others thus making the Congress an international affair.

A commercial exhibit will be held under the auspices of the National Association of Road Machinery and Material Manufacturers, and arrangements have already been made for the exhibition of the collection of road models owned by the United States Government. The President of the United States and the Governor-General of Canada will be urged to attend and already the foremost engineers and highway officials of the country have accepted places on the programme. The President of the Congress, is L. W. Page, director, United States Office of Public Roads.

Conditions of Competition Announced

The commission of architects appointed by the Government to direct the preparation of designs for the new Departmental buildings at Ottawa, recently submitted its rereport outlining the conditions of the competition. It will be open to competitors throughout the British Empire. There will be at least two buildings, and probably a third one for the Courts, and half a million superficial feet of floor space will have to be provided. Designs of a general character will first be submitted and from this number the best six will be selected. The authors of these will be asked to elaborate their designs. The one finally selected will superintend the work based on his plans, and will be given a 5 per cent. commission. The cost of the buildings will probably aggregate five million dollars. The other five competitors who will be asked to develop their general designs will each receive $3,000. The sketches will be received up to January 2 next. Then three months will be given for the best half-dozen to develop their plans. The competitor whose plans are accepted will be given a further period of four months to prepare working plans. Afterwards tenders will be called for, but in view of the time allowance this will not be before next autumn.

The Geological Congress

The members of the Twelfth International Geological Congress held their meeting in the city of Toronto, Ont., August 7 to August 14. This body is one of the most notable scientific organizations that has ever visited that city. In all, some 600 delegates were present, representing 45 different nationalities. On Wednesday evening, August 6, the members began to assemble at the University buildings, coming in groups from the trips for geological observation which were arranged for by the local committee under the chairmanship of Prof. Coleman. On Thursday morning the Congress was formally welcomed by the Hon. W. H. Hearst, Minister of Lands, Forests and Mines for Ontario, and by Acting Mayor Church on behalf of the city of Toronto and Dr. Falconer on behalf of the University of Toronto. The official welcome was delivered by Sir Chas. Fitzpatrick, who gave a message from H. R. H., the Duke of Connaught, Governor-General of Canada, welcoming the delegates and regretting his absence. The chief question for discussion on Thursday was the World's Coal Resources. The discussion was introduced by a paper read by Mr. R. W. Brock, General Secretary of the Congress, which discussed the monograph which has been prepared by a special committee, dealing with this important question. The discussion was continued by M. A. Defline, an eminent French engineer, who dealt with the coal resources of France, while Dr. Krunsch delivered a paper by M. Boker, dealing with the coal fields of Germany. In the evening Emmanuel de Margerie, Past President of the Geological Society of France, delivered before the Congress in Convocation Hall, an address on the plotting of a geological map of the world.

The Congress will continue its sessions until August 14, when a number of additional trips to points of geological interest in Canada will be made. The President of the Congress is Dr. F. D. Adams, F.R.S., Dean of the Faculty of Applied Science and Logan Prof. of Geology of the McGill University, Montreal.

Convention at Cleveland

The National Paving Brick Manufacturers' Association United States will convene at Cleveland, Ohio, September 17 and 18. Formerly meetings have been held during the winter months but last year it was decided to hold future conventions during the "open season."

This will afford, instead of the usual program of written papers, discussion and criticism of brick street and brick road construction methods while work on the highways is in actual progress. The large amount of construction work in Cleveland and Cuyahoga County will afford splendid opportunity for investigation in a most practical way. Officers of the National Paving Brick Manufacturers' Association are: Charles J. Deckman, Cleveland, president; Will P. Blair, Cleveland, secretary; C. C. Barr, Streator, Illinois, treasurer.

The New York Board of Water Supply recently made corrosion tests on several metals by burying samples in the earth for six months, and periodically wetting the earth with dilute solutions of corrosive salts. The losses noted were:—Phosphor bronze, 0.09 per cent.; Tobin bronze, 0.11; monel metal, 0.12; manganese bronze, 0.12; Muntz metal, 0.33; and steel 1.04 per cent.

Personal Mention

Mr. James Wilson, a contractor at Welland, and formerly of Brantford, Ont., died recently as the result of a train accident at the former place.

Mr. W. A. Casey, until recently a member of the staff of Mr. C. H. Topp, consulting engineer, Esquimalt, has been appointed municipal engineer of that city.

Messrs. William Binnie and R. S. Tickell are preparing a report on Ottawa's water supply. Sir Alexander H. Binnie, of London, Eng., who had the work in hand, was forced to abandon the task owing to ill-health.

Messrs. Ross & Macdonald of Montreal, have been appointed architects for the Halifax terminals of the Intercolonial Railway. The plans include a passenger station and train shed, estimated to cost a million dollars.

Mr. E. P. A. Phillips, B.A.Sc., O.L.S., who for some time past has been associated with the firm of J. G. Mackay, Hamilton, has been appointed corporation surveyor of Port Arthur, Ont. Mr. Phillips is a graduate in the faculty of civil engineering of the University of Toronto.

Mr. Allan George, architect, son of Sir Ernest George, late President of the R. I. A. B., England, has taken into partnership Mr. Walter A. Moorehouse who has been with Sproatt & Rolph for some years. Business will be carried on at 6[illegible] Victoria street, Toronto, under the name of Allan George & Moorehouse.

Mr. W. A. McLean, Ontario Provincial Engineer of Highways, and vice-chairman of the new commission, has returned to Toronto after a two months' tour abroad, during which he made a thorough study of road systems and methods in England, Scotland, France, Switzerland, Germany and Belgium.

Mr. A. E. Grant, formerly manager of the Cardiff office of the British Insulated and Helsby Cables, Limited, will assume the position of managing director of the Canadian British Insulated Company, Montreal. Mr. A. E. Grant is a brother of Mr. Lawford Grant former managing director of the company.

Mr. Lawford Grant will assume his new position in connection with the Eugene Phillips Electrical Works, Montreal, immediately. Mr. Grant recently resigned from the position of managing-director of the Canadian British Insulated Company, Limited, Montreal, but retains the presidency of the company.

The Committee of Management of the International Engineering Congress, 1915, announces that Col. Geo. W. Goethals, Chairman of the Isthmian Canal Commission and Chief Engineer of the Panama Canal, has consented to accept the Honorary Presidency of the Congress and will preside in person over the general sessions to be held in San Francisco September 20-25, 1915.

Improvements in Tokio Harbor

Tokio harbor improvements costing $10,000,000, says the Engineering Record, are to be constructed during the next ten years, according to a report from the U. S. consul general at Yokohama. Three or four large dredges are to be ordered at the outset, together with rails and other material for a 5-mile construction railway. The improvement project contemplates the reclamation of 1,191 acres of waterfront by utilizing the output of the excavating operations. There will be a canal 5 or 6 miles long, 270 ft. wide at the base and 372 ft. at the top, with a depth of from 12 to 25 ft. at low tide. The excavation operations will cover in all an area of more than 1,000 acres. The need for this improvement is based upon an estimated average annual freight movement of 3,500,000 tons, 80 per cent. of which originates in Yokohama. The freight charges per ton are at present from 58 to 92 cents, but it is estimated that these can be reduced to from 29 to 42 cents.

Concrete Insert

Through an oversight the name of the manufacturers of the concrete insert described on page 63 of the Contract Record, July 30, was omitted. The makers of the insert are the Star Expansion Bolt Company, 147 Cedar street, New York. The advantages of the insert are readily seen when it is considered that the threaded device for the insert may be installed when the concrete is being poured and the timbers can be changed around or replaced with little trouble and without drilling new holes and greater strength and security is obtained.

Public Roads and Highways Commission

The Ontario Government in order to carry out its policy of extensive roadway improvement, has appointed a commission to investigate thoroughly methods of construction and maintenance of highways and to prepare a report to be submitted to the government. The members of the commission are Messrs. Charles A. Magrath, C.E.; William A. McLean, C.E., and A. M. Rankin, M.P.P. Mr. Magrath is at present chairman of the Canadian section of the International Deep Waterways Commission and has had a wide experience in various engineering works, notably roadmaking in the Canadian Northwest. Mr. McLean is at present Provincial Highway Engineer for Ontario and for the past nine years has devoted himself to the work of improving the provincial highways. Mr. Rankin has been connected with the good roads movement for some time and at present is vice-president of the Ontario Good Roads Association. The province is to be congratulated on the personnel of the commission.

Mainly Constructional

The News in Brief—From Coast to Coast

West Vancouver is to have a new waterworks system costing $100,000.

The city of Toronto is spending the sum of $250,000 on new buildings for the Canadian National Exhibition this year.

The summer convention of the Ontario Granite and Marble Dealers' Association was held at London, Ont., on August 4th.

The new Barry Hotel at Saskatoon was recently opened to the public. This is a four-storey building with basement and cost about $200,000.

The members of the Saskatoon Builders' Exchange have started a movement to bring about the removal of duty on all building material in the Canadian west.

The value of building permits issued in Vancouver for the month of July totalled $441,085, making a total for the first seven months of the year of $10,206,732.

By the decision of the Montreal Board of Control, building permits will now be required for municipal buildings as well as for any other buildings erected in the city.

It is expected that the new Ontario Provincial Highways Commission will hold a meeting in a few days to discuss arrangements for their tour of the United States in search of road information. Until the commissioners return from that tour no policy will be mapped out.

The city of Calgary contemplates the construction of a third municipal paving plant and expects to be in a position to handle all its own paving work next year.

Street Commissioner Wilson of Toronto will apply to the Board of Control for co-operation in some new drastic building laws in so far as they affect the condition of the streets.

The Roger-Miller Company, of Toronto, was awarded the contract for the Prince Edward Island terminal at Carleton Point of the Intercolonial car ferry. The figure is $950,000.

Building operations continue active in Welland. Permits for July amounted to $89,710 and for the past seven months $318,896, nearly twice the total for the same period last year.

The large dredge, which was under construction at the Polson Iron Works, Toronto, for dredging the harbor at Port Nelson, has been completed. It is 180 feet long, 44 feet wide and cost $270,000.

Railway construction on the Grand Trunk Pacific east of Prince Rupert, B.C., is going ahead rapidly, good progress having been made during the past month. Track was laid to mile 218 east of the Pacific Coast.

A catalogue of the Herbert Morris Chain and Hoist Company, Limited, has come to hand. The list contains a good deal of descriptive matter concisely stated and is well illustrated. It will repay a careful study.

The amount of building permits in Toronto for the first seven months of this year was $17,657,321, as compared with $15,494,845 for 1912. The permit of the new Dominion Bank, amounting to $1,000,000, was recently issued.

Building permits issued in Montreal for July amounted to $1,555,665, a slight falling off from July of last year. The total value of the permits issued during the first seven months of 1913 is $11,497,950. This is an increase of 17 per cent. over the same period last year.

About eleven miles of sewer work is now under construction at Edmonton. This work has been in progress for over two years and at least another year of steady work will be necessary to complete it. Over $2,000,000 has been expended on this sewer system.

Tenders have been called for the construction of a second section of the Montreal conduit system. The work is from Craig street to Pine avenue, and from Atwater avenue to Guy street on St. Catherine street. Mr. G. M. Gest has now the first part of the system in hand.

The Government has retained Mr. C. S. McInnes, K.C., of Toronto, to represent it in preparing the case to be submitted to the International Waterways Commission with reference to the projected damming of St. Mary's River at Sault Ste. Marie by the Michigan Lake Superior Power Company.

A commission of engineers consisting of Mr. W. A. Bowden, of the Railway Department; Mr. Jefferson Chapleau, of the Public Works, and Mr. W. J. Stewart, of the Hydrographic Survey, will go to the scene early in August to secure data upon which the case will be based.

It is understood that the Canadian Northern Railway is seeking from the Government running rights over the Intercolonial Railway to take effect from the time when its Montreal to Port Arthur line is finished. The privilege will, of course, not be required until the construction of the line is much further advanced, particularly on the section between Port Arthur and Montreal.

It is expected that the Hudson Bay Railway will be completed by December, 1914. The work is being pushed ahead with great vigor, and the development of the terminal facilities at Nelson are being driven ahead so rapidly that the resources of the new port will assist materially in finishing the northern portions of the railway. There are at present 1,200 men on this work and it is hoped that 150 miles of grading will be completed this fall.

We acknowledge the receipt of a volume from Messrs. Drummond, McCaul & Company, of Montreal, dealing with the "Stoney" sluice as manufactured by Ransomes & Rapier, Limited, of London, England. The volume describes some of the difficulties encountered with the solid weir and shows the advantages of the "Stoney" sluice, together with its application in numerous large engineering works, such as the Manchester ship canal, and the Assuan dam on the Nile. The book is a model of workmanship.

The marine architects, Messrs. F. E. Kirby and W. T. Donnelly, New York, are in Prince Rupert, B.C., preparing to carry out the construction of the drydock for the Grand Trunk Pacific Railway. A floating type of dock is to be provided with a capacity for vessels of 20,000 tons. The shipbuilding shed that is to stand over the launching platform will be a splendid piece of work. It is designed to have a covered space 86 feet by 200 feet, with a clear height under the cranes of 50 feet and under the girders of 56 feet.

The exhibit of Canadian Allis-Chalmers, Limited, at the Convention of the Canadian Association of Stationary Engineers held at Owen Sound included a perfect working model of ⅜ in. size Squire's trap. Water was supplied to it by a small centrifugal pump driven by an electrical motor, and a great deal of interest was taken in its operation. This was supplemented by very interesting literature covering the new type Barrow Combination Fire and Water Tube Boiler, and also literature covering Cochrane Feed Water Heaters and Steam specialties. The exhibit was in charge of Mr. C. N. Schrag assisted by Mr. J. G. Boyer.

The meeting of the steel and the completion of the laying of the rails for the Ginson and Minto railway in the vicinity of Fredericton, N.B., which is being operated by the C. P. R., took place recently. A temporary bridge has been erected over the Burpee stream to replace the one which was carried away last winter, and this will be used along with others until the steel structures are ready for erection. The new line is for hauling coal principally, and while the road is to be put into service immediately it is not expected that the company will take it over from the contractors until September, as there still remains a considerable amount of work to be done in the way of ballasting and finishing up, and the contractors are hurrying this along as rapidly as possible.

Messrs. Magoon & Macdonald, architects, Edmonton, have been awarded the first prize of $2,000 for the plans submitted by them for the proposed new masonic temple in that city. The building will be a six-storey one and is estimated to cost $500,000. Owing to the present financial situation it is not proposed to erect the temple immediately, but a start will probably be made next spring.

The American Consul at Gothenburg has reported that the Swedish State Railway authorities are experimenting with the use of peat powder, prepared on the Ekelund system, for use in locomotives in place of coal. The powder is delivered to the fire-box through a pipe, and is consumed with the aid of special apparatus invented by an engineer named H. von Porat. It is claimed that this method enables 1½ tons of powder to give the same results as are obtained with 1 ton of coal, that the powder does not cause the emission of sparks or smoke, and that it lessens the labour of stoking.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Waterworks, Sewerage and Roadways

Dundas, Ont.
Cement walks planned by City Council. Mayor, E. A. Woodhouse. Plans, specifications, etc., at office of Clerk, J. S. Fry, Town Hall, who will receive tenders until August 13. 9,000 feet.

Guelph, Ont.
Paving Eramosa Road planned by City Council. Sec., T. J. Moore, City Engineer, M. Ferguson.

Hamilton, Ont.
Sewer, $2,000, Barnesdale Boulevard, between Dunsmuir Ave. and Main St., planned by City Council. Clerk, S. H. Kent.

Islington, Ont.
Tenders received by Clerk, J. A. L. Macpherson, until August 11th, for 4,000 lin. ft. concrete sidewalk in villages of Lambton and Humber Bay. Plans at office of clerk.

Le Pas, Man.
Sedimentation basin. Tenders received by Sec.-Treas., H. H. Elliott, M.D., till August 20th, 1913, for construction of sedimentation basin. Gravel is 75 c. f.o.b. The Pas. Plans, specifications, etc., at offices of Resident and Consulting Engineers, Murphy & Underwood, Ross Bldg., Saskatoon.

London, Ont.
Tile sewers on Wellington and Partridge streets. Chairman Board of Works, B .W. Bennett. Engineer, W. N. Ashplant. Tenders are to be called at once.

Montreal, Que.
Underground conduits for Board of Commissioners. Sec., L. N. Senecal. Engineer-in-charge, Dr. Herdt, McGill University. Tenders received by Sec., City Hall, until 12 o'clock August 15th, for construction of a system of underground conduits, main and service manholes, transformer chambers, etc., in, upon and adjoining portion of St. Catherine street, between Atwater Ave and Guy street. Plans, etc., at office of Electric Commission, New Birks Bldg. Also in adjoining Bleury St. and Park Ave., between Craig St. and Pine Ave. Contract No. 3.

Peterboro, Ont.
Pavements for City Council. Tenders received by Chairman Board of Works, William Buller, until August 20th, for bitulithic, asphaltic, concrete and Portland cement, concrete pavement, on Hunter, George and Charlotte streets. City Engineer, R. H. Parsons.

Port Dalhousie, Ont.
Waterworks system for Town Council. Clerk, T. G. Wand. Reeve, J. Sutton. Plans prepared.

Toronto, Ont.
Sewers planned by Board of Control. Mayor, H. C. Hocken. Tenders received until August 19th. Specifications at office of Commissioner of Works, 22 streets.

CONTRACTS AWARDED

Montreal, Que.
Road improvements, Longueuil, for Montreal & Southern Counties Railway, Canada Express Bldg., Montreal. General contractors, Massicotte & Frere, c/o H. Beauregard, 70 St. James. Concreting between tracks and road about 1 mile of work.

Ottawa, Ont.
Pavement, cost $15,000, Dalhousie, for City of Ottawa. City Engineer, Archibald Currie, City Hall. General contractors, Ottawa Construction Company. Asphalt pavement between Sussex and St. Andrew.

Winnipeg, Man.
Sewers for Board of Control. Sec., M. Peterson. Engineer, H. N. Ruttan, 223 James Ave. General contractors, The Dominion Construction Co., 290 Selkirk Ave., for sewer in McKenzie St. from Mountain to Anderson Ave. General contractor, J. W. Ashley, Engineer of Construction, City yards, for sewer in Niagara St., Crescent Road to Godfrey Ave.

Railroads, Bridges and Wharves

Annapolis Royal, N.S.
Piers. Tenders received by Secretary, R. C. Desrochers, Dom. Govt., Dept. of Public Works, Ottawa, until September 3rd. Plans, etc., at office of C. E. W. Dodwell, Dist. Engineer, Halifax, F. G. Goodspeed, Dist. Engineer, St. John, Postmaster, Annapolis Royal, and at Department, Ottawa.

Burks Falls, Ont.
Dredging for Dom. Govt. Dept. of Public Works. Tenders received by Sec., R. C. Desrochers, Ottawa, until August 20th, for dredging Magnetawan River. Plans at office of Dept.

Calgary, Alta.
Stations for C. N. Rly. Company's architect at Winnipeg has prepared plans for stations on Vegreville-Calgary Line at Rise Deer, Benyou, Redland, Rockyford, Barntill, Hawick, Lyall, Norfolk, Cheslermer Lake and Barlow. On the Saskatoon-Calgary Line at Excel, Cereal, Chiriook, Dobson, Youngestown, Stanmore, Richdale and Modena.

Chatham, Ont.
Grand Trunk Railway Company has been authorized to construct spur to premises of Dowsley Spring & Axle Co., Ltd.

Twp. Deacon, Ont.
C. N. O. Rly. Co. has been authorized to construct bridge to carry line across Petawawa River (west crossing) Twp. Deacon, Dist. Nipissing, mileage 159.3 west of Ottawa.

Peterboro, Ont.
Canadian Pacific Railway Company has been authorized to construct spur for the De Laval Dairy Supply Company.

Two bridges, McDonnel and Park Sts., for City Council. Tenders received by Chairman Board of Works, William Buller, until 5 p.m. August 20th, for reinforced concrete arch bridge, 26 ft. span, 66 ft. long on Park St. Reinforced concrete slab and beam bridge, 27 ft. span, 66 ft. long, on McDonnel St. City Engineer, R. H. Parsons.

Poupore, Que.
Pier and revetment wall for Dom. Govt. Dept. of Public Works. Tenders received by Sec., R. C. Desrochers, Ottawa, until Sept. 2nd for construction of etaoin hm bmbm m hr daiartdar thar ar training pier and revetment wall. Plans, etc., at offices of J. L. Michaud, Dist. Engineer, Post Office Bldg., Montreal, J. G. Sing, Dist. Engineer, Confed. Life Bldg., Toronto, Postmasters at Buckingham and Poupore and at Dept., Ottawa.

Prov. of Quebec
Bridge, cost $2,950, McGibbon Bridge, for Municipal Council of St. Philippe. Mayor, Henry Dixon. Sec.-Treas., H. B. Marton. Plans, etc., at office of Sec.-Treas. One span, 40 x 17, concrete, steel and 4 in. red pine.

Bridge, cost $6,650, over Red River, planned by Municipal Council of Coteau du Lac. Mayor, Dr. Elz. Deguire. Sec.-Treas., A Dauth. Plans, etc., at office of Sec.-Treas. One span, 75 x 17, concrete, steel and 4 in. red pine.

Bridge, cost $4,400, over Missisquoi River, for Municipal Council of East Bolton. Sec.-Treas., J. F. Bryant. Plans, etc., at office of Sec.-Treas. One span. 55 x 14, concrete, steel and 4 in. red pine.

Bridge, cost $4,300, over Muddy Creek, for Municipal Council of Chatham No. 1. Mayor, Aime Dickson. Sec.-Treas., Geo. B. Martin. Plans, etc., at office Sec.-Treas. One span, 40 x 17, concrete, steel and 4 in. red pine.

Bridge, over Thetford River, for Municipal Council of Black Lake City. Mayor, Dr. C. D. Paradis. Plans, etc., at office of Sec.-Treas., Albert Houle. One span, 75 x 17, concrete, steel and 4 in. red pine.

Bridge, over Chateauguay River, for Municipal Council of Ste. Martin. Sec.-Treas., Nap Mallette. Plans, etc., at office of Sec.-Treas. One span, 250 x 17. concrete, steel and 4 in. red pine.

Bridge, cost $3,300, over Pointe due Jeur Creek, for Municipal Council of Lavaltrie. Plans, etc., at office of Sec.-Treas., Sim. Martineau. One span, 25 x 16, concrete, 5-15 in. I beams, 29 ft. long, steel and 4 in. red pine.

Regina, Sask.
C. P. R. Co. has been authorized to

construct spur for the Saskatchewan Motor Company, Limited.

St. Catharines, Ont.
Tenders received by Dom. Govt., Department of Railways and Canals, L. K. Jones, Secretary, Ottawa, until August 27th for section No. 3, Welland Ship Canal. Plans, etc., at office of Chief Engineer of Department, Ottawa, and Engineer in charge, St. Catharines.

Track ties for Dom. Govt. Dept. of Railways and Canals. Tenders received by Sec., L. K. Jones, Ottawa, Ont., until August 14th, for track ties for Welland Ship Canal. Specifications, etc., at office of Dept. Purchasing Agent, Ottawa, Ont.

St. Martin Junction, Que.
C. P. R. Co. has been authorized to construct spurs for Laurentide Brick & Sand Co., Ltd. Co. l'Assomption, Parishes of St. Henry de Mascouche and Lechenaie at mileage 12.25 from St. Martin Junction.

Sooke Harbour, B.C.
Dredging for Dom. Govt. Dept. of Public Works. Tenders received by Sec., R. C. Desrochers, Ottawa, till August 27th. Plans, specifications, etc., at office of Department.

Stratford, Ont.
Station, cost $60,000, for G. T. R.. General Supt. Ont. Lines., H. E. Whittenberger, Montreal. Two storeys, red brick and granite, fireproof. Plans prepared.

G. T. Ry Co. has been authorized to construct siding for Farquharson Gifford Co., Ltd.

Streetsville, Ont.
C. P. R. Co. has been authorized to construct spur for Medina Shale Brick Co., Ltd., and Streetsville Brick Co., Ltd.

Swift Current, Sask.
C. P. R. Co. has been authorized to construct spur for Revelstoke Saw Mill Co., Ltd., across 5th Ave. and Block 123.

Toronto, Ont.
Grand Trunk Railway Company has been authorized to construct sidings for Harris Abattoir Co., Ltd., north of St. Clair ave., crossing Symes Road.

Electric railway planned by Forest Hill Railway Company. Representative, T. J. Glover, Temple Bldg. York Twp. Council have granted franchise. Will operate in neighborhood of Eglinton ave. Forest Hill Road, Bathurst and Dufferin.

Pier for Dom. Govt. Dept. of Public Works. Tenders received by Sec., R. C. Desrochers, Ottawa, until Sept. 2nd, for East Pier, eastern entrance Toronto Harbor. Plans at office of Sec., J. G. Sing, Confed. Life Bldg., Toronto, H. J. Lamb, Windsor, Ont. Reconstruction of part of superstructure.

Upper Salmon River, Que.
Extension to breakwater. Tenders received by Sec., R. C. Desrochers, Dom. Govt. Dept. of Public Works, until Sept. 2nd. Plans, etc., at offices of F. C. Goodspeed, Dist. Engineer, St. John, Geoffrey Stead, Dist. Engineer, Chatham, N.B., Postmaster, Upper Salmon River, and at Dept., Ottawa.

Winnipeg, Man.
Switching apparatus, cost $4,830, Board of Control. Sec., M. Peterson. Engineer, J. G. Glassco, 54 King St., for supply and erection of switching apparatus for generating and terminal stations to Canadian Westinghouse Co., Ltd., Portage Ave. E.

CONTRACTS AWARDED

Annapolis Royal, N.S.
Railway station, cost $12,000, for Dom. Atlantic Railway (C. P. R.) Engineer, M. A. Fullington, Kentville, N.S. General manager, P. Gifkins, Kentville. General contractors, Falconer & McDonald, 59 Granville St., Halifax. Work to start at once.

Galt, Ont.
Freight sheds, cost $12,000, Main street, for C. P. R. Co. General contractor, Jas. S. Webster. Carpenter, W. Hallman. Painting, J. W. Swain. Plumbing, I. Lockhart. One storey, 150 x 40, cement foundation, brick construction.

Kelly's Cove, N.S.
Extension to breakwater for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractors, A. W. Girroir & R. H. McDonald, Antigonish, N.S.

London, Ont.
Bridge substructure, Wharncliffe Rd., for City Council. Mayor, C. M. R. Graham. Engineer, W. N. Ashplant. General contractors, Bain & Ross, Embro, Ont., $6,441. Cement abutments and approaches for new bridge.

Montreal, Que.
Freight sheds and offices, cost $90,000, Wellington, for G. T. R., McGill street, Montreal. Architects and builders, Jno. S. Metcalf Co., Ltd., 54 St. Francois Xavier. Roofing, Campbell-Gilday Co., 663 St. Paul street.

Ottawa, Ont.
Railway for Ottawa & Morrisburg Elec. Rly., Can. Life Bldg. Sec., R. S. Bishop, Canada Life Bldg. General contractors, R. J. Tierney Co., Ottawa. Construction of right-of-way, including stations, etc., cost will average $10,000 to $12,000 per mile, minimum of 12 miles to be constructed.

Pitt River, B.C.
Dredging, cost $158,220, for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractors, The Pacific Dredging Co.

Prov. of Quebec
Bridge, cost $3,500, over Le Bourdais River, for Municipal Council of St. Tite. General contractor, E. Bourassa, Three Rivers. Plans, etc., at office of Sec.-treas., J. J. Cloutier. One span, 60 x 16, concrete, steel and 4-in. red pine.

Bridge, cost $3,500, over Esturgeon River, for Municipal Council of Ste. Martine. General contractor, Narcisse Beaudreau, Beauharnois, Que. Plans, etc., at office of Sec.-Treas., Nap. Mallette. One span, 40 x 17, concrete, steel and 4 in. red pine.

River Du Loup En Haut, Que.
Dredging for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractors, W. J. Poupore Co., Ltd., 124 Board of Trade Bldg., Montreal.

St. Paul, Man.
Bridge for Municipality of St. Paul. Sec.-Treas., W. Gorham, Birds Hill, Man. General contractors, Fowler & Young, 221 McDermott Ave., Winnipeg. Reinforced concrete construction.

South Edmonton, Alta.
Station and freight sheds, cost $40,000, for C. N. Rly. Architect, R. B. Pratt, Room 461 Union Depot. General contractor, Geo. McLeod, 497 Raglan Road, Winnipeg.

Steveston, B.C.
Jetty, cost $83,500, for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractors, Broley & Martin, New Westminster, for complete jetty at mouth of Fraser River.

Public Buildings, Churches, Schools, etc.

Chapleau, Ont.
Hospital, cost $15,000. Tenders received by Architects, Gordon & Helliwell, 525 Confederation Life Building, Toronto. Architect is desirous of immediate tenders, guaranteed delivery of material on the job. Concrete foundation, brick veneer construction.

Charlottetown, P.E.I.
Sanitarium, cost $30,000, for Prov. Govt. Dept. of Public Works. Acting Sec., W. F. Fidmarsh, 8 Brighton Road. Architect, Archibald Scopes, c/o Scopes & Fenstman, New York, N.Y. Site has been purchased near North Wiltshire, 14 miles from Charlottetown. Concrete foundation, frame construction.

Edmonton, Alta.
Masonic temple, cost $50,000, Jasper Ave., for Masonic Temple Assn. Architects, Magoon & MacDonald, Tegler Bldg. Eight storeys, 1st 2 storeys granite construction. Plans drawn.

Fredericton, N.B.
Central fire station, cost $12,000, King St., planned by City Council. Clerk, J. W. McCready. Architect, Kenneth M. Campbell, Springhill, N.B. Preliminary plans have been approved and tenders will be called. Three storeys, brick construction, 110 ft. long.

Gravelbourg, Sask.
Interior fittings for post office, Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Plans, etc., at office of Postmaster, Gravelbourg, W. T. Mollard, Clerk of Works, Regina, and Department, Ottawa. Tenders received by Secretary till August 25.

Halifax, N.S.
Tenders will be received until Sept. 2, for the construction of a wooden lighthouse tower at Five Islands, Colchester County. Plans, specifications, etc., at Dept. Marine and Fisheries, Ottawa and Halifax, and Post Offices Truro, Parrsboro, Economy and Five Islands. Address, A. Johnston, Deputy Minister of Marine and Fisheries.

Kamloops, B.C.
Drill hall for Dom. Govt. Dept. of Militia and Defence. Plans, specifications, etc., at Dist. Officer Commanding Military District No. 10, Victoria, City Clerk, Kamloops, and Director of Engineer Services, Ottawa. Tenders received by Sec., E. F. Jarvis, Ottawa, till noon August 16, 1913.

Louth Twp., Ont.
School, cost $6,000, planned by Trustees School Sec. No. 7. Tenders receiv-

ed by architect, A. E. Nicholson, St. Catharines, Ont., until Aug. 27th. One storey, 40 x 46, stone foundation, brick construction, Georgia pine floors.

Montreal, Que.
Children's school, cost $45,000, Cedar Ave., for Children's Memorial Hospital. Architects, Brown & Vallance, 44 Canada Life Bldg. Excavating, W. V. Brennan, 6 Lincoln Ave., Verdun. Tenders received by Architect for all other trades. Cement foundation, Montreal limestone and Laprairie brick.

Church, cost $25,000, St. Henri Ward, for St. Henri Parish. Contract will be signed about March, 1914. Tenders received by Architect, J. T. Decarie, New Birks Bldg. 180 x 50.

Ottawa, Ont.
Government buildings for Dom . Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Chief Architect, D. Ewart. Commission appointed by government have prepared conditions for competition. Sketches will be received until January 2nd, 1914. Estimate cost of buildings $5,000,000. Open to all British Architects.

Underground lavatory, cost $15,000, City Hall Square, for City of Ottawa. Mayor, J. A. Ellis. Architect, F. C. Sullivan, Castle Bldg., Queen St. Concrete foundation. brick construction.

Parrsboro, N.S.
Post office and customs fittings. Tenders received by Dom. Govt., Dept. of Public Works, R. C. Desrochers, Secretary, Ottawa, until August 25th. Plans, etc., at office of J. C. McDougal, Clerk of Works, Parrsboro, W. Bishop, Inspector of Dominion Buildings, Halifax, and at Department, Ottawa.

Quebec, Que.
Theatre, cost $60,000, N. D. des Anges, for P. Allaire & Jos. Desvaresne, 7 and 9 Notre Dame des Angres. 135 x 75. Plans in progress.

Regina, Sask.
Church, cost $70,000, 8th Ave., for St. Andrews Presbyterian Church. Architects, Reilly, Dawson & Reilly, 512 Westman Chambers. Brick foundation and construction. Plans prepared.

Toronto, Ont.
Registry Office planned by Board of Control. Mayor, H. C. Hocken. Time has been extended until October 1st for filing competitive plans.

Memorial gateway, cost $4,000, High Park Ave. and High Park, planned by Board of Control. Park Commissioner has had plans prepared. Tenders will be called shortly.

Winnipeg, Man.
Postal sub-station, Portage and Lipton streets, for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Have purchased site at corner of Portage Ave. and Lipton street.

Refrigeration plant, cost $12,470. Board of Control. Sec., M. Peterson. Engineer, H. N. Ruttan, 223 James Ave. For supply of motor driven refrigerating plant and refrigerator boxes for King Hospital, Morley Ave. to Linde Can. Refrigeration Co.. Youville Sp. and St. Peter St., Montreal.

Excavation for church, cost $50,000, Cathedral ave., for St. Johns Presbyterians. Pastor, Rev. J. P. Jones, Bannerman ave. Architect, R. L. Smith, 417 Somerset Bldg. Excavation contractor, Arthur Morrison, 37 Athol ave. Tenders will be called shortly for construction of basement. Remainder will be done next year.

Drill hall, for Dom. Govt. Dept. of Public Works. Tenders received by Sec., R. C. Desrochers, Ottawa, until Sept. 3. Plans at office of Dept. and H. E. Matthews, Supt. Architect of Dominion Public Buildings, Winnipeg.

CONTRACTS AWARDED

Beauport, Que.
Drill hall, cost $30,000, for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractor, Celestin Parent, Beauport.

Charlottetown, P.E.I.
Rebuilding church, cost $200,000, for St. Dunstan's R. C. Cathedral. Builders, John S. Metcalf Co., Ltd., 54 St. Francois Xavier Street, Montreal. Supt. of Construction, F. R. Hodge, Box 217. Walls to be reinforced with brick and cement, steel beams, 45 x 30, 2 storeys.

Edmonton, Alta.
Addition to hospital, cost $55,000, 8th ave. west, planned by City Commissioners. Architects, Wilson & Herrald, Balim Block. General contractors, Alson & Johnson, University Grounds. Two storeys, 20 x 52, brick and stone construction, brick foundations. Excavating done

Greenwood, B.C.
Post office, cost $41,000, for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractors, Jno. Benmis & Son.

Le Pas, Man.
School, cost $76,578, for Dom. Govt. Dept. of Indian Affairs, Ottawa. General contractors, Snyder Bros., Portage La Prairie

Matane, Que.
Public building for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractors, J. H. Morin & Son, Trois Pistoles, Que.

Medicine Hat, Alta.
School, cost $8,000, Bridge Street, for School Board. Architects and builders, Sackrider & Turner, Toronto and Main Streets. Two storeys, 50 x 100, brick and structural steel construction.

Montreal, Ont.
Addition to post office, cost $20,200, Lachine, for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Architect, Dalbe Viau, 76 St. Gabriel. General contractor, Adolphe Gauthier, City Building Inspector, Lachine. One storey, 30 x 40.

Ottawa, Ont.
Hall, cost $6,000, for St. John Evangelist Church. Architects, Horwood, Taylor & Horwood, Sparks St. Mason, Geo. Ambridge, Besserer. Carpenters, Taylor & Lackey, 1st ave. Stone foundation, solid brick construction, felt and gravel rfg.

Addition to church, cost $4,000. Clarence, for St. John Evangelist Church. Architects, Horwood, Taylor & Horwood, Sparks St. General contractor, Geo. Ambridge, Besserer. Stone foundation, brick construction.

Quebec, Que.
School, cost $200,000, Massue, for The Catholic School Commission. Architect, R. P. Lemay, 19 d'Aiguilion. General contractors, Jinchereau & Lamonde, Que. Masonry and plastering, J. B. Jinchereau, 325 Richardson. Carpentry, P. A. Lamonde, 52 St. Francois. Roofing, Eug. Falardeau, 143 Dorchester. Painting, Marier & Tremblay, Bridge Street. Heating, plumbing, and electrical work, Fortunat Gingras, St. Augustin St. Three storeys and basement, 150 x 75, stone foundation, Scotch brick construction.

Repairs to No. 3 fire station, Dorchester, for City Council. Mayor Nap. Drouin, City Hall. General contractor, carpenter, steel, Le Boivin, 202 Richelieu. Roofing, E. Falardeau, 143 Dorchester. Painting, Simard & Frere, 270 St. Joseph.

Red Deer, Alta.
Armory, cost $36,000, for Dom. Govt. Dept. of Militia and Defence. Sec., E. F. Jarvis, Ottawa. Architect, C. A. J. Sharman. General contractors, Nesbit & Miller. Two storeys, stone foundation,

Rothesay, N.B.
Addition to college residence for Rothesay Collegiate School, c/o Rev. W. R. Hibbard. Architect, G. E. Fairweather, 13 Germain street, St. John. General contractor, Jas. Henderson.

Regina, Sask.
Jewish Synagogue, cost $15,000, planned. President, S. Pearlman, Tenth avenue and Broad Street. General contractors, Melville & Dowell. 30 x 50, brick and stone construction, slate roofing. Foundations in.

Toronto, Ont.
Theatre, cost $8,500, 373 Yonge street, for E. Jackson, 661 Spadina Ave. Architect, J. W. Siddall, 75 Yonge St. General contractor, Thos. McCarty, 20 O'Hara. Two storeys, 33 x 130, brick foundation.

Winnipeg, Man.
Addition to Synagogue, cost $10,000, for Schaarez Schomajim Synagogue, Dagmar street. Architect, M. Blankstein, 450 Dufferin ave. General contractors, A. J. Bennett & Bros., Confederation Life Bldg. Stone foundation, pressed and common brick construction. Seating capacity will be increased by 200.

Club building, cost $50,000, Broadway. for Adanas Club, 208 Main street. Architects, Pratt & Ross, Electric Railway Chambers. General contractors, National Construction Co., 307 Donalda Bldg. Steel, Vulcan Iron Works, Point Douglas ave. Plumbing, Bearto Plumbing Co., Fort St. Electrical work, McDonald & Willson Lighting Co., 309 Fort St. Three storeys, brick construction.

Business Buildings and Industial Plants

Bradford, Ont.
Watson Limited contemplate building a factory. Ratepayers to vote August 12th to loan $42,000 to company for twenty years.

Fort William, Ont.
Warehouse, cost $35,000, Hardisty, for

Fife Hardware Co., Hardisty street. Tenders received by architect, R. E. Mason. Four storeys, 60 x 125, cement and pile foundation, brick construction.

Hamilton, Ont.
Alterations to store, cost $5,000, York St., for Duff Stores, Ltd. Architects, Watt & Blackwell, Lister Chambers. Tenders received by owner.

Store, cost $5,000, King St., for B. H. Webster, Wentworth and King streets. Tenders received by architect, F. W. Warren, 808a Bank of Hamilton Bldg. One storey, 24 x 80, cement foundation, pressed brick construction.

Medicine Hat, Alta.
Candy factory, cost $25,000, for John H. Taber et al. President, Ald. W. H. Doty. Vice-president, Chas. England, Redcliffe, Alta. Plans in progress.

Montreal, Que.
Store, cost $20,000, Viger, for J. B. Drapeau, 915 St. Hubert. General contractor and builder, D. Dupras, 430 Champlain. Brick, Treffle Guilbeault, 914a Demontigny. Carpentry, general contractor. Steel, Phoenix Bridge Co., 83 Colborne. Tenders for roofing, plastering, painting, heating, plumbing and electrical work to close in about two weeks with general contractor.

Garage, cost $20,000, Maisonneuve (Notre Dame near St. and Desjardins) for Elz. Dansereau, 673 Notre Dame. Architect, C. A. Reeves, 38 St. James. Three storeys, 43 x 100, concrete foundations. Plans ready.

Factory for Metals Extraction, Ltd., c/o L. G. Glass, 30 St. James St. Company has authorized capital of $100,000. Plans in progress.

Pt. Rowan, Ont.
Shoe store, cost $7,000, planned for Harrison Harringer, Main St. Plans may be obtained from owner. Two storeys, stone and cement foundation, white brick construction.

Regina, Sask.
Office and store, cost $20,000, Broad, for Geo. Broder, Winnipeg St. and Victoria ave. Two storeys, brick construction and foundations, maple and concrete floors. Plans in progress.

Richmond Hill, Ont.
Greenhouse, cost $50,000, for J. H. Dunlop, 644 Lansdowne ave., Toronto. Architects, Gordon & Helliwell, 525 Confederation Life Bldg., Toronto. Boilers and heating, H. V. Pierce, Detroit. Tenders called for boiler house. Owner building greenhouse probably by day labor. Necessary equipment required. Concrete foundation, steel construction.

St. Catharines, Ont.
Factory, cost $40,000, Carleton, planned for Armstrong Cork Co., Pittsburg, Pa. Architect, company's architect. Tenders received by owners. One storey, concrete foundation, frame and galvanized iron construction.

Toronto, Ont.
Hotel, cost $35,000, Danforth Ave. & Dawes Rd. Architects, Ellis & Connery, Manning Chambers. Three storeys, concrete foundation, stone and brick construction.

Victoria, B.C.
Bank building planned for Bank of British North America. Site purchased at S.W. corner of Superior and Menzies St. Plans will be prepared.

Windsor, Ont.
Addition to laundry, cost $15,000, Wyandotte, for I. O. Sanboran. One storey, 47 x 46. Work to be done by day labor. Complete equipment required.

CONTRACTS AWARDED

Edmonton, Alta.
Biscuit factory for North West Biscuit Co. Manager, Mr. Shaw, 348 Jasper Ave. E. General contractors, Wilson & Hughes, 348 Jasper Ave. E. Two stys., brick construction, three ovens, full equipment required.

Halifax, N.S.
Warehouse, Windsor street, for Rhodes Curry Co., Ltd., Amherst. John MacLellan, foreman, Robie St. General contractor, owner. Warehouse to be built on Windsor street instead of old site on Robie street.

Hamilton, Ont.
Addition to store, cost $5,000, King E. for Walter Howell, Emerald and King Sts. Architects, Mills & Hutton, Bank of Hamilton Bldg. General contractors, Hogan & Farr, 15 Fairholt Ave. Two storeys, stone foundation, brick construction.

Medicine Hat, Alta.
Store and residence, cost $5,000, 4th ave., for J. N. MacLeod, 111 Montreal St. Architect and builder, owner. Two storeys, 35 x 50, frame.

Moncton, N.B.
Factory, cost $9,700, Botsford, for Maritime Hat & Cap Co., Church. Architect, H. C. Mott, 13 Germain Street, St. John. General contractors, R. C. Donald and S. O. Humphrey. Three storeys, 75 x 50.

Montreal, Que.
Office and light manufacturing building, cost $25,000, 146 St. Urbain, for Succession David Ouimet, 8th floor, 136 St. James. General contractor, Gilbert Demers, 1215 St. Denis.

Store and residence, cost $6,000, Mountain, for H. N. Cohen, 129 Mountain St. Architect, L. J. T. Decarie, New Birks Bldg. General contractors, Purves & Henderson, 214 St. Antoine. Two stys., 31 x 60, concrete foundation, brick construction.

Addition to factory, cost $30,000, Parthenais street, for Dom. Oilcloth Co., 1192 St. Catherine E. Architects, Hutchison, Wood & Miller, 50 Royal Insurance Bldg. General contractors, Church, Ross & Co., 40 Hospital St. Roofing, D. M. Long, rear 39 Windsor.

Factory, cost $8,000, Provinciale Lane. Builder and owner, Mariotti Marble Co., 269 Ottawa. One and two storeys, 132 x 107, brick construction.
Shoe factory, cost $11,000, Carriere, for British Construction Co., 238 St. James. Architects and builders, owners. Mason, Ant. Violanga, 624 St. Christopher. One storey and basement, 100 x 45.

Port Arthur, Ont.
Stores and offices, cost $425,000, for Jas. Whalen & Co. Architects, Brown & Vallance, 32 Canada Life Building, Montreal. General contractors, Canadian Stewart Co., E. T. Bank Bldg., Montreal. Tenders called by general contractor for marble and tile work, painting and glazing. General contract closed August 7th.

Richmond, Que.
Hotel for J. H. Lane, Main street. Architect, C. E. White, 137 Wellington St., Sherbrooke. Iron and steel, MacKinnon, Holmes & Co., Sherbrooke. Four storeys, 86 x 80.

Regina, Sask.
Office building, cost $15,000, Scarth, for Canadian Financial Corporation. General contractor, H. Black, New Black Block. Two storeys, brick construction, concrete foundation.

Saanich Inlet, B.C.
Hotel, cost $76,000, Brentwood Bay. Owner, c/o architects, Hault & Horton, 729 Fort St. General contractor, A. Lacoursiere, 1312 Gladstone. Three stys. and basement, frame and roughcast construction. Forty rooms, billiard room. Swimming tank 150 ft. long.

St. Stephen, N.B.
Shoe factory, cost $10,855, for Town-Council. Mayor, Mr. Dinsmore. Clerk, Jas. Vroom. Inspector of construction, David Johnston. General contractor, Thos. Toal. Two storeys, cement foundation, frame construction. Work to start at once.

South Edmonton, Alta.
Store and apartments, cost $8,000, 19th ave. south, for L. L. Pearce, 16 Jasper Ave. E. Architect, C. W. Morehouse, 27 Jackson Block. General contractors, Chappel Bros., 102 York St. Two stys., 33 x 55, frame construction.

Toronto, Ont.
Two stores and residences, cost $12,000. Owner and general contractor, W. J. Young, 27 Danforth ave. Architect, P. H. Finney, 79 Adelaide St. E. Work to be done by day labor. Three storeys, brick construction, felt and gravel rfg.

Warehouse, cost $35,000, 145 College St., for Temple Pattison Co., 12 Queen E. Architects, Denison & Stephenson, 20 King W. General contractors and carpenters, Carlyle & Son, 18 Toronto St. Mason, H. Needham, 148 Crawford. Five storeys, 138 x 41, concrete and brick foundation, brick and steel constr.

Walkerville, Ont.
Addition to Office Bldg., for Canadian Bridge Co. General contractor, Victor Williamson, Huron and Walker Road. Contract for 70 h.p. boiler and equipment awarded to Messrs. E. Leonard & Sons, London.

Residences

Dundas, Ont.
Residence, Sydenham, for W. M. Armstrong, King St. Architect, M. H. Hewitt. Tenders received by owner until August 13th. Three storeys, 24 x 34,

cement foundation, artificial stone construction.

Hamilton, Ont.

Residence, cost $6,000, for E. Carlton, Balmoral Hotel. Architects, McPhie, Kelly & Darling, Bank of Hamilton Bldg. 2½ storeys, 33 x 40, stone foundation, pressed brick construction. Plans in progress.

Two residences, cost $5,000, Locke St., for Mrs. Geo. Husband, c/o architects, McPhie, Kelly & Darling, Bank of Hamilton Bldg. 2½ storeys, 17 x 40, stone foundation, brick construction.

Medicine Hat, Alta.

Residence, cost $4,000, Alberta. Architect and owner, T. Montgomerie & Co., 12 Hull Block. Two storeys, 28 x 36, frame construction.

Montreal, Que.

Flats, cost $16,000, Coloranie, for D. Raymond, 1896 Clark. Three storeys, 216 x 40, brick construction. Plans ready.

Apartment house for Metropolitan Apartment Co., Ltd., c/o J. G. Avard, 120 St. James St. Above company capitalized at $250,000 and will build in the fall. Plans not decided yet.

Residence, Pointe Claire, for G. Napier. Tenders received by architects, Turner & Carless, 116 Board of Trade Bldg., Montreal. Three storeys, 70 x 50, concrete foundation, field stone, roughcast and brick construction.

Flats, cost $12,000, Fortune Ave., for L. Lavinge, 140 Gordon ave. Architect and builder, masonry, carpentry, plastering and painting, owner. Roofing, heating and plumbing, owner open for tenders. Three storeys, 75 x 50, brick construction.

Ottawa, Ont.

Residence, cost $7,000, Wilbrod, for Wolf Shenkman, 226 Friel St. Architect, F. C. Sullivan, Castle Bldg., Queen St. 2½ storeys, 33 x 40, stone foundation, brick construction.

Sandwich, Ont.

Two family flat, cost $5,000, for Wm. Jackman. Architects, G. Jacques & Co., Windsor, Ont. Two storeys, 26 x 44, frame construction.

Toronto, Ont.

Residence, cost $6,000, for E. E. Horton, 13 Rose ave. Architects, Gordon & Helliwell, 525 Confederation Life Bldg. Residence to be built in place of apartment house. Tenders received by architect. Three storeys, stone foundation and brick construction, shingle roofing.

Residence, cost $5,000, Greenwood, for H. Seddon, 122 Brock ave. Architect, E. R. Conlan, 73 Glendale ave. Owner calling for tenders for all trades. Plans and specifications at 122 Brock ave. 2½ stys., 24 x 30, stone foundation, brick construction.

Residence, cost $8,000, York Mills Rd., for Mrs. Chas. Catto, c/o architects, Page & Waffington, Confederation Life Bldg. Stone and brick construction. Contracts not yet awarded.

Bungalow, cost $8,000, Port Credit. Owner's name withheld. Architect, J. A. Thatcher, 31 Queen W., Toronto. Cobble stone construction.

Apartment, cost $15,000, Winchester St. Owner's name withheld. Architect, L. Foulds, 21 Leader Lane. Three stys., concrete foundation, brick and stone construction.

Vancouver, B.C.

Residence, cost $15,000, for Dr. M. F. Keeley, 736 Granville street. Architect, M. L. Taylor, Dominion Bldg. 2½ stys., and basement, 40 x 42, frame and stucco construction. Plans ready.

Victoria, B.C.

Apartment building, cost $12,000, for Thomas & Dawson, c/o architect, Jesse M. Warren, 503 Central Bldg. Two stys., and basement, frame and stucco constr,

Westboro, Ont.

Residence, cost $5,000, Highland ave., for W. Hager, Main St. Stone foundation, brick veneer construction. Plans in progress.

Residence, cost $4,500, Highland ave., for Geo. Linton. 2½ storeys, stone foundation, brick veneer construction. Plans in progress.

Winnipeg, Man.

Residence, cost $50,000, Wellington Cres., for Mrs. I. V. Chalmers, 57 Carlton St. Architects, Jas. Chisholm & Sons, Enderton Bldg. Three storeys, concrete foundation, stone construction. Tenders will be called shortly.

CONTRACTS AWARDED

Brandon, Man.

Residence, cost $4,000, 7th St., for G. W. Kerr, 258 12th St. Architect and Builder, A. C. Jones, 816 7th St. Two storeys, 36 x 48, frame construction.

Edmonton, Alta.

Residence, cost $4,000, 4th ave. north, for C. M. Rummel, 622 7th St. N.W. Architect, E. W. Morehouse, Jackson. General contractors, Chappel Bros., 102 York street. Two storeys, 24½ x 46½, frame construction. Foundations in.

Residence, cost $4,000, 22nd, for Cushing Bros., Elizabeth St. Two storeys, 28 x 44, frame construction.

Halifax, N.S.

Residence, cost $6,300, Lucknow, for H. H. Stanford, 156½ Hollis St. Builders, Maxner & Dunlop, 152 Windsor St. doing all work. 2½ storeys, 27 x 48, cement foundation, frame construction.

Medicine Hat, Alta.

Residence, cost $9,500, Ogiltree Street, for J. Shields, 205 Main St. Architect and builders, Hotson, Leader & Goode, Main St. Three storeys, 26 x 38, brick and stone construction.

Residence, cost $5,500, Crescent Hts., Lot 7, Block 16, for A. McCarter, 825 Main St. Architect and builder, owner. Two storeys, 30 x 42, frame and artificial stone construction.

Residence, cost $4,200, Lawton Street, for A. R. Pointer, City Hall. Architect and builders, Hotson, Leader & Goode, Main St. 2½ storeys, 26 x 36, frame, cement foundation.

Residence, cost $8,500, for J. E. Davies, c/o Alberta Foundry & Machine Company. Architects, Bourne & Morrison, Huckvale Block. Work done by day labor in charge of Mr. Young, 428 Toronto street. 2½ storeys, 34 x 40, cement foundation, frame construction.

Residence, cost $4,000, Charles, for E. Schmid, C. P. R. Depot. Architects and builders, Hotson, Leader & Goode, Main street. Two storeys, 26 x 30, frame.

Montreal, Que.

Flats, cost $9,000, Maisonneuve(between Wm. David St. and 4th avenue). Architect and builder, Alberic Lemaiy, 274 1st ave., Viau.

Residence, Westmount (Redfern Ave.) for W. J. Brennan, 421 Mount Pleasant. Architects, Gordon & Aird, 115 Stanley St. Masonry, Murray & McRitchie, 20 St. Nicholas. Carpentry, Bromsgrove Guild, 456 Clarke. Plastering, MacIntyre Plastering Co., 53 Latour. Painting, Alex. Craig, 41 Jurors. Heating and plumbing, Thos. O'Connell, 183 Ottawa. Roofing and electrical work not let.

Apartment house, cost $10,000, Ed. Charles, for Eusebe Lecavalier, 65 Cherrier. Builder, Mr. Chasse, 4221 Chateaubriand. Three storeys, 26 x 69, cement foundation, solid brick construction.

Five flats, cost $15,000, Visitation, for British Building Co. Architect and builder, owner. Painting, Come Chaterand, 497 Dorchester St. E. Plumbing, E. Callaghan, 28 Gallery Sq. Three stys., 41 x 85.

Terrace four residences, cost $22,000, Westmount (Holton ave.) for J. B. Scott, 30 Springfield. Architect and builder, owner. Two storeys and basement, 22 x 50, reinforced concrete construction.

Residence, cost $7,000, Bordeaux. Builder and owner, Mercure Hardware & Lumber Co., 1124 Rachel St. Three storeys, 50 x 40, cut stone and brick construction.

Residence, cost $25,000, Pine Ave., for J. A. Trudeau, 22 Notre Dame W. Architect, Wilford A. Gagnon, Room 1002 New Birks Bldg. General contractors, John Quinlan & Co., 4412 St. Catherine W. Two storeys, 23 x 35, concrete foundation, stone and brick construction.

Two residences, cost $9,000. Westmount, Burton ave., for J. H. Norris, 122 Arlington ave. General contractor, carpentry, roofing, owner. Plastering and painting not let till August 26th. Heating, plumbing and electrical work, August 12th.

Flats, cost $6,500, Verdun, Gordon, for Messrs. Valiquette & L. Lavigne, 140 Gordon. Builder, L. Lavigne. General contractors, owners. Tenders received by builder for roofing, heating and plumbing. Three storeys, 36 x 44, brick construction.

Quebec, Que.

Residence, cost $11,000, Lockwell, for Chrysante Jobin, 3 Racine. General contractors, carpentry, painting, interior fittings, owner. Masonry, plastering, Edward Belanger, Beauport. Roofing, heating, plumbing, electrical work, P. Paradis, 236 d'Aiguillon. Three storeys, 48 x 35, stone foundation, red and stock brick construction, galvanized iron and asbestos paper rfg. Excavating started.

Residence, cost $10,000, Lockwell. General contractor, carpenter, J. E. Jobin, 107 d'Aiguillon. Masonry, plastering, Ed. Belanger, Beauport. Roofing, heating, plumbing, electrical work, P. Paradis, 236 d'Aiguillon. Painting, Pelchait & Aubin, 182 Bayard. Three storeys, 50 x 43, galvanized iron and asbestos rfg.

Residence, cost $10,000, Limoilou, cor. 6th St. and 3rd Ave., for Nap. Bergeron, Montmorency Falls. General contractor and carpenter, Ed. Bouchard, 234 Prince Edouard St. Masonry and plastering, D. Guerin, Beauport. Three storeys, 76 x 32, Scotch brick construction.

Residence, cost $21,000, Maisonneuve, for J. V. Auger, Maisonneuve street. General contractor and mason, J. Giroux, 56 4St. Francois. Roofing, heating, plumbing and electrical work, Jobin & Paquet, 72-78 Cote d'Abraham. Four storeys, 99 x 53, solid brick construction.

Regina, Sask.

Residence, cost $6,000, Lorne. Owner and general contractor, D. J. Ruttan, Lorne St. Brick construction, concrete foundation. Excavating started.

Residence, cost $5,000, Robinson street. Architect and general contractor, W. F. Surtees, 12th ave. Two storeys, frame and brick construction. Foundations in.

Residence, cost $5,000, Garnet. Owner and beneral contractor, F. Bruce, Garnet Street. 2½ storeys, brick construction, concrete foundation.

Sault Ste. Marie, Ont.

Residence, cost $4,500, Caston Sub. D. Owner and builder, D. Jannison, Albert St. Two storeys, 26 x 31, stone foundation, brick veneer construction. Excavating started.

South Edmonton, Alta.

Residence, cost $4,500, 2nd ave. north. Architect and owner, Mrs. S. L. McLellan, 776 Whyte ave. west. General contractor, Thos. Leake ,4th ave. s.w. 2½ storeys, 26 x 38, frame.

Residence, cost $4,500, University ave. Architect and owner, Dr. McPherson, Hulbert Block. General contractor, T. W. Jackson, Commercial Hotel, Whyte ave. 2½ storeys, 37 x 28, brick veneer and roughcast construction.

Residence, cost $4,000, 5th ave. north, for Haug & Blakotad, Box 4581. Architect and builder, owner. Two storeys, 24 x 38, frame, cement foundation.

St. John, N.B.

Bungalow, cost $6,000, Mt. Pleasant. Architect and owner, W. P. Queen, Canada Life Bldg., Prince Wm. St. General contractor, R. A. Corbett, Douglas ave.

Toronto, Ont.

One detached and one pair residences, cost $6,000, Cloverdale. General contract and owner, R. C. Grieves, 53 Gladstone ave. Two storeys, 33 x 42, pair, stone foundation, brick construction.

Residence, cost $9,000, for W. H. Baker, 84 Wellington W. Architects, Chadwick & Beckett, 18 Toronto St. Work done by day labor. 2½ storeys, 38 x 50, stone foundation, stone, brick and steel construction.

Seven pair residences, cost $15,000, Fairmount Cres. General contractor and owner, H. E. Bond, 53 Shuddell. Owner will sublet heating, plumbing, wiring and plastering. Two storeys, 33 x 40, pr. stone foundation, brick construction.

Three pair residences, cost $12,000, Bowmore. General contractor and owner, H. E. Bond, 53 Shuddell. Owner will sublet heating, plumbing, wiring and plastering. Two storeys, 34 x 40, brick foundation, brick construction.

Residence, cost $8,000, Port Credit, for Father McCaffery, Port Credit. Architects and builders, Jno. Miller & Son, Port Credit. Plumbing and heating, D. P. J. Hayes, 1245 Queen W. Work done by day labor. Stone foundation, stone and brick construction.

Three residences, cost $7,000, Sellers ave., for Moore Bros., 10 Penwood ave. Architect, P. H. Finney, 79 Adelaide St. E. General contractor, owner. 2½ stys., brick foundation, frame and brick construction. Work to be done by day labor.

Residence, cost $6,000, Wells Hill ave., for Thos. Holmes, 10 Wells Hill Ave. Architect, J. Hunt Stanford, Bloor and Ossington. General contractor, owner, will sublet. 24 x 36, stone foundation, brick construction.

Five hundred residences, about $2,500 each, North of Danforth ave., for McEachren & Sons, Ltd., King St. E. Superintendent in charge, A. H. Martin, c/o McEachren & Sons, Ltd. Intend to build 500 houses if demand holds out, in lots of 15, one lot already completed. Work being done by day labor. Brick construction, stone foundation.

Residence, cost $14,000, E. Roxboro, for F. K. Birge, c/o architects, Sproatt & Rolph, 36 North St. Masonry, W. Hughes, 216 Simcoe St. Two storeys, brick construction, brick foundation.

Winnipeg, Man.

Two residences, cost $4,200 each, Norwood. Architects and general contractors, Whitlaw & McFadyen, 601 Electric Railway Chambers, Winnipeg. 2½ stys., and basement, frame construction, stone foundation. Excavating started.

Three residences, cost $9,000 each, River Heights. Whitlaw & McFadyen, 601 Electric Railway Chambers, Winnipeg. 2½ storeys and basement, brick veneer construction. Foundations in.

Residence, cost $9,000, Kingsway. Architects and general contractors, Andrews & Sons, Portage & Victor. 2½ storeys and basement, brick veneer and stone construction, stone foundation. Excavating started.

Residence, cost $25,000, Assiniboine ave., for Rev. C. W. Gordon, 567 Broadway. Architect, G. W. Northwood, 502 Northern Crown Bank Bldg. General contractors, J. McDiarmid & Co., Canada Bldg. 2½ storeys, brick veneer construction, stone trimmings, stone foundation.

Power Plants, Electricity and Telephones

St. John, N.B.

Power house for St. John Street Railway Co. Manager, H. M. Hopper, Dock St. General contractors, A. R. C. Clark & Son, 51 Water Street.

Winnipeg, Man.

Ornamental street lighting standards for Board of Control. Secretary, M. Peterson. Engineer, J. G. Glassco, 54 King St. General contractors, Dawson & Co., Ltd., 56 Albert St., for 90 double arm ornamental poles, type "E" at $110.60 each. 40 single arm ornamental poles, type "B" at $90.10 each.

Addition to power house, cost $35,000, Rover St., for Board of Control. Secretary, M. Peterson. Engineer, J .G. Glassco, 54 King St. General contractors, Fort Garry Construction Co., Ross and Arlington Sts.

Addition to dorkshop, Morley avenue for Board of Control. Secretary, M. Peterson. Engineer, Geo. Stoker, Secretary of Hospital Commission for addition to power house to be used as ambulance, garage, mechanic's workshop & storeroom. Plans, specifications, etc., at office of Engineer. Tenders received by Chairman, Board of Control, till 11 a.m. August 15.

Miscellaneous

Listowel, Ont.

Fire equipment. Town Council contemplates purchase of fire equipment. Mayor, Wm. Climie.

Ottawa, Ont.

Wooden tug for Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractor, W. H. Kelly Lumber Co., Buckingham, Que. 50 ft. 6 in. single screw wooden tug.

Cable for City Council, Electrical Dept. Engineer, Supt. J. E. Brown. Tenders received by Chairman Electrical Department, until August 14th. 47,000 ft. of underground lead covered cables and 14 induction regulators.

Prescott, Ont.

Tenders received by Minister, Alex. Johnson, Ottawa, Dom. Govt., Dept. of Marine & Fisheries, until August 28th for construction of single screw steel steamer, 164 ft. 6 in. over all, breadth mounlded 30 ft., depth moulded 13 ft. Specifications at office of Purchasing Agent of Dept., Ottawa, Collector of Customs, Toronto, Collingwood, Port Arthur and at Agencies of Marine & Fisheries, at Montreal, Quebec, St. John, Halifax & Charlottetown, P.E.I.

Summerside, P.E.I.

Rifle range for Dom. Govt., Dept. of Militia & Defence. Secretary, E. F. Jarvis, Ottawa. Tenders to be called as soon as property transfers are made. Three or four target range, steel constr.

Winnipeg, Man.

Tenders received by Secretary of Bd. of Control, M. Peterson, until July 31st for 15,000 lbs. 500,000 C.M. weatherproof, insulated, triple braided, stranded copper wire, 10,000 lbs. No. 0000 C.M. weatherproof, insulated, triple braided, stranded copper wire.

Business Notes

Athabasca Landing, Alta.

Grand Union Hotel and The Athabasca Hotel burned. Other building destroyed, Royal Bank Bldg., Bank of Commerce, Barracks of R. N. W. M. P., Warehouse of Athabasca Forwarding Co. Several houses and stores owned by Isaac Gagnon, total loss, $750,000.

Charlottetown, P.E.I.

Sash and door factory and woodworking mill owned by H. P. Hagan, burned. Loss $25,000; no insurance.

Hymers, Ont.

Saw mill owned by Hymers Bros., burned. Loss $30,000; no insurance.

Hensall, Ont.

Business block owned by R. Bell, burned, loss $10,000. Occupants, F. C. McDonnell, jeweler and Hugh McLean, dry goods.

Humboldt, Sask.

Business block occupied by Burnison Bros. Stockert & Elliott, barber shop

(Continued on page 74)

Tenders and For Sale Department

Tenders Wanted

Sealed tenders will be received by the undersigned up to the **15th day of August, 1913,** for the heating of the Walkerton Public Library. Plans and specifications may be seen at the office of the secretary, Walkerton, or at the office of Mr. Geo. Gray, architect, Harriston. The lowest or any tender not necessarily accepted. W. B. Thompson, Secretary. 32-33

Tenders for Concrete Bridges

Sealed tenders, addressed to William Buller, Chairman Board of Works, Peterborough, Ont., and endorsed "Tenders for Concrete Bridges," will be received until 5 p.m., **Wednesday, August 20th, 1913**, for the construction of a reinforced concrete arch bridge of twenty-six (26) ft. span, sixty-six (66) ft. long on Park St., and for a reinforced concrete slab and beam bridge of twenty-seven (27) ft. span, sixty-six (66) ft. long, on McDonnel Street. Separate tenders for each bridge shall be made. Plans and specifications may be seen at the City Engineer's office, Peterborough, Ont. Each tender must be accompanied by an accepted cheque for five per cent. of the amount of the tender. The lowest or any tender will not necessarily be accepted.

Peterborough, Ont., Aug. 5, 1913.

33 R. H. PARSONS, City Engineer.

Tenders for Dredging

Sealed tenders, addressed to the undersigned, and endorsed "Tender for Dredging, Magnetawan River," will be received until 4 p.m., Wednesday, 20th August, 1913, for dredging required at Burks Falls, Ont.

Tenders will not be considered unless made on the forms supplied, and signed with the actual signatures of tenderers.

Combined specification and form of tender can be obtained on application to the Secretary, Department of Public Works, Ottawa. Tenders must include the towing of the plant to and from the work. Dredges and tugs not owned and registered in Canada shall not be employed in the performance of the work contracted for. Contractors must be ready to begin work within thirty days after the date they have been notified of the acceptance of their tender.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, for five per cent. (5 p.c.) of the contract price, (no cheque to be for less than fifteen hundred dollars), which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, August 1st, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—45752. 32-33

Tenders for Pavement

Sealed tenders addressed to William Buller, Chairman Board of Works, Peterborough, Ont., and endorsed "Tenders for Pavement," will be received until 5 p.m., **Wednesday, August 20th, 1913**, for the construction of Bitulithic and Asphaltic Concrete Pavements on George and Charlotte Streets and for Bitulithic, Asphaltic Concrete, and Portland Cement Concrete Pavements on Hunter Street, Peterborough.

Plans and specifications may be seen at the City Engineer's office, Peterborough, Ont. Each tender must be accompanied by an accepted cheque for five (5) per cent. of the amount of the tender.

The lowest or any tender will not necessarily be accepted.

R. H. PARSONS, City Engineer.
Peterborough, Ont., Aug. 5, 1913. 33

Tenders for Construction of Sidewalk

Sealed tenders, plainly marked as to contents, will be received at the office of the undersigned, up to 6 p.m. of **Saturday, August 16th, 1913,** for the construction of a concrete sidewalk on Russell Hill Road, in the Township of York.

Plans and specifications and all necessary information may be seen at the office of the undersigned, 57 Adelaide St. East, Toronto.

The lowest or any tender not necessarily accepted.

FRANK BARBER,
Township Engineer.
Toronto, August 9th, 1913. 33

Sealed tenders addressed to the undersigned, and endorsed "Tender for Clock Tower, Public Building, Brampton, Ontario," will be received at this office until 4 p.m., on **Monday, August** 18, 1913, for the construction of a Clock Tower to the Public Building at the place mentioned.

Plans, specification and form of contract can be seen and forms of tender obtained at the Post Office, Brampton, Ontario, and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, July 28, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—44785. 32-33

TENDER

Tenders will be received by A. B. Falconbridge, Township Clerk, Aberfoyle, up to 8 p.m **Wednesday, August 20**, for the construction a Beam Bridge on sideroad 15 and 16, Concession 1, Township of Puslinch, known as Paddock's Bridge.

Plans and specifications may be seen at and forms of tenders obtained from the office of Malcolm & Rudd, Engineers, Guelph.

A marked cheque for **$25** must accompany each tender as a guarantee of good faith.

The lowest or any tender not necessarily accepted.

MALCOLM & RUDD, Engineers
Guelph, August 6, 1913.

Tenders Wanted

Sealed tenders will be received up to noon on the **16th day of September, 1913**, by the undersigned at Cayuga, Ontario, for the construction of twenty-six and one-half miles of stone macadam road in the County of Haldimand.

The work will be let in three separate and distinct contracts, not necessarily to the same individual.

Tenderers are required to examine the localities of the work and are required to be present at the opening of the tenders at 2 p.m. on Wednesday, the 17th day of September, 1913.

Plans and specifications may be seen at the office of the County Engineers, Messrs. Jackson & Kyd, Dunnville, or may be had from them on the payment of **$10**, which sum will be refunded on return of the documents.

Lowest or any tender not necessarily accepted.

T. A. SNIDER, K.C., County Clerk,
County of Haldimand,
32-37 Cayuga, Ont.

Sealed tenders, addressed to the undersigned, and endorsed "Tender for East Pier, Eastern Entrance, Toronto Harbor, Ont.," will be received at this office until 4 p.m. on **Tuesday, Sept. 2, 1913** for the reconstruction of part of superstructure of East Pier of Eastern Entrance to Toronto Harbor, in the County of York and Province of Ontario.

Plans, specification and form of contract can be seen and forms of tender obtained at this Department and at the offices of J. G. Sing, Esq., District Engineer, Confederation Life, Building, Toronto, Ont., and H. J. Lamb, Esq., District Engineer, Windsor, Ont.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent (10 p of the amount of the tender, which will be forfeited if the person tendering declines to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary

Department of Public Works,
Ottawa, August 1, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—43525. 32-33

THE PAS, MANITOBA

Notice to Contractors

Sealed tenders, registered and endorsed on the envelope, "Tender for (tender bidding on)" and addressed to H. H. Elliott, M.D., Sec.-Treas. of the Town of The Pas, Man., will be received up to 6 p.m., **August 20th, 1913**, for the construction of the following works:—

Tender A—Construction of Sedimentation Basin.

Tender B—Foundations for Power House.

Gravel 75c f.o.b. The Pas, Man.

Marked cheque for five per cent. (5 p.c.) of the amount of the bid must accompany each tender, or in lieu of the said cheque, the tenderer may furnish the bond of an approved surety company.

Plans, specifications and instructions may be seen at the offices of the Consulting Engineers, Saskatoon, or at the Resident Engineer's office at The Pas, Man., or plans and specifications will be given or forwarded on a deposit of Twenty ($20) Dollars—the deposit cheque to be returned if the plans and specifications are returned with the tender.

H. H. ELLIOTT, M.D., Sec.-Treas.,
The Pas, Man.
MURPHY & UNDERWOOD,
Consulting Engineers,
32-33 Ross Bldg., Saskatoon, Sask.

Department of Railways and Canals, Canada

Trent Canal

Port Severn Section—Severn Division

Notice to Contractors

Sealed tenders, addressed to the undersigned and marked "Tender for Port Severn Section—Severn Division, Trent Canal," will be received at this office until 2 o'clock p.m., on **Monday, August 25th, 1913.**

Plans, specifications and form of contract to be entered into can be seen on or after July 26th at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, at the office of the Superintending Engineer, Trent Canal, Peterborough, Ont.; at the office of the District Engineer, Public Works Department, Midland, Ont., and at the office of the Postmaster, Orillia, Ont.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labour, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque on a chartered bank of Canada, for the sum of $10,000 made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES,
Asst. Deputy Minister and Secretary.
Department of Railways and Canals,
Ottawa, 29th July, 1913.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.—45677. 32-33

Some Good Machines

Buckeye Trenching Machine, 12 in. x 4½ ft, A1 ... ... $700

Buckeye Trenching Machine, 27 in. x 8 ft.; just through shops; as good as new $2,500

Parsons Trenching Machine, 2 ft. x 5 ft. to 20 ft. deep. A1 ... ... $3,500

Thew No. 0 Steam Shovel. Overhauled by Thew Manufacturers last year. A1 ... ... $2,800

TRACTION ENGINE

Located in Canada, 30 H.P.

undermounted, double Avery machine, coal burner with rear mounted Steel Water Tank. Also an Avery Steel Water Tank on truck with pump. Cost, new, $3,575. This is in first-class condition $1,800

WHAT DO YOU NEED IN SECOND-HAND EQUIPMENT?

TRY US!

WILLIS SHAW MACHINERY CO.

La Salle Street, Chicago. Ill.

Notice to Contractors

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on Tuesday, August 19th, 1913, for the construction of the following works:—

SEWERS

Earlscourt Drainage System, No. 2—Davenport Rd. and Station Rd.

Carlaw Ave. Storm Overflow Sewer, Section No. 2.

Midway Sewer System, outlet via Hiawatha Ave., Gerrard St. and Morley Avenue.

Division No. 2, West Toronto, Woodville Ave.

East Toronto, Section "A," outlet.

Balsam Ave., from Queen St. to Kingston Rd.

Birch Ave., from Queen St. to Lake Front.

Munro Park Ave., from Queen St. to Lake Front.

Neville Park Boulevard, from Queen Street to Lake Front.

Melita St., from Christie St. to 558 ft. east.

Ashworth Ave. from Christie to 531 ft. east.

Awde St. from Dufferin St. to 689 ft. west.

Fort Rouille Ave. from Springhurst Ave. to 142 ft. south.

Lane first north of Bloor St. from Dovercourt Road to east end.

Wilfred Ave. from Servington Cres. to Belsize Drivt South.

Oswald Cres. from S.S. Manor Rd to Wilfred Avenue.

Belsize Drive North, from Thurloe Ave. to Wilfred Ave.

Glebe Rd. from Tullis Drive to Yonge St.

Thurloe Ave. from Servington Cres. to Belsize Drive North.

Servington Cres. from S.S. Manor Rd. to W.S. Thurloe Ave.

Woodbine Ave. from 200 ft. north of Queen St. to Kingston Road.

Berwick Ave. from Yonge St. to 528 ft. west.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications may be seen and forms of tender obtained at the office of the Commissioner of Works, Toronto.

Tenderers shall submit with their tender the names of two sureties (approved of by the City Treasurer, not members of the City Council or officers of the Corporation of the City of Toronto), or, in lieu of said sureties, the bond of a Guarantee Company approved as aforesaid.

The usual conditions relating to tendering as prescribed by the City By-law must be strictly complied with.

The lowest or any tender not necessarily accepted.

H. C. HOCKEN, Mayor,
Chairman Board of Control.
Toronto, August 7, 1913.

Department of Railways and Canals, Canada

SOULANGES CANAL

Rebuilding Head of Guard Pier at Cascades Point, Que.

Notice to Contractors

Sealed tenders, addressed to the undersigned and marked "Tender for rebuilding head of Guard Pier, Lower Entrance, Soulanges Canal," will be received at this office, until noon, on **Friday, August 29th, 1913.**

Plans, specifications and form of contract to be entered into can be seen on or after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Superintending Engineer, Quebec Canals, Birks Building, Phillips Square, Montreal.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached tht actual signature, the nature of the occupation and place of residence of each member of the firm.

An accepted bank cheque on a chartered bank of Canada for the sum of $5,000 made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into a contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES,
Asst. Deputy Minister and Secretary.
Department of Railways and Canals,
Ottawa, 9th August, 1913.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.—46228. 33-34

For Sale

One Koehring Concrete Paving Mixer, capacity 14 cu. ft.

One Austin Cube Concrete Paving Mixer, capacity 9 cu. ft.

One 20 h.p. Case Traction Engine.

All of above used only a few months and in perfect condition.

Apply Box 831, Contract Record, Toronto, Ont. 29-t.f.

Situations Wanted

Architectural Draughtsman open for engagement. Capable Superintendent, having had large practical experience.

Moderate remuneration to get established. Reliable. Box 849, Contract Record, Toronto. 33

Sand, lime and brick engineer, expert in all silicate products with 18 years experience in Germany, England and the U. S. A., with all machinery and systems, wants to get acquainted with interested parties. Fritz Klaeck, Alexandria, Ont. 33-34

Position Wanted—Engineer, electrical and mechanical, age 26, with extensive workshop experience and University training, desires suitable engagement, more particularly on the sales staff. References. Box 850, Contract Record, Toronto, Ont. 32-33

Special Notice

Every man who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works are advertised.

Send along your plans when asking for tenders put a line in your advertisement to that effect.

No extra charge is made for filing plans at one or all four offices.

Contract Record and Engineering Review

Montreal—119 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—429 Pender Street.

Business Notes

(Continued from page 71)

and pool room, and Hallings bakery, completely destroyed. Loss $50,000.

Louiseville, Que.

Stores and residences, burned. Owners, J. E. Beland, shirt factory and residence, loss $35,000; Mr. Francis Trepanier, store and residence, $10,000; L. Asselin, shoe store and residence, $10,000; Gerard Chevailer, factory, $3,000; J. Bourret, store, stables and residence, $25,000; Eugene Bellemare, shop and residence, $4,000; O. Pichette, bakery, $3,500.

Montreal, Que.

Racing stables of Montreal Driving Club, Delorimier Park, Chausse and St. Jerome, burned, loss $7,000. Owners will rebuild. Secretary, Roy Irving.

Sash and blind factory, 206 Papineau ave., owned by Albert M. Wener, 170 McGill St., burned; loss $7,000.

Ottawa, Ont.

Factory, owned by W. D. Ardley, 427 Bank St., burned, loss $6,000. Will rebuild.

Factory owned by Mica Co. of Canada, Ltd., 532 Wellington St., burned, loss $3,000. Will start up again. New machinery wanted.

Revelstoke, B.C.

City Hotel, Clayton Tapping, proprietor, completely destroyed by fire. Loss $32,000.

St. Catherines, Ont.

Brewery storehouse of Taylor & Bates burned. Loss, $6,000; insured.

St. John, N.B.

Stores burned owned by Mrs. A. E. Jones, dry goods; E. W. Moir, Woodstock, N.B., drug store; loss $18,000, covered by insurance.

New Companies

Commercial Power, Light and Coal Co., Ltd., has been incorporated with a capital of $250,000, to carry on the above business in all its branches, with head office at Winnipeg, the incorporators are F. M. Burbidge, barrister, R. C. McPherson, accountant, and R. W. Killey, clerk, all of Winnipeg.

Dorval Land Company, Ltd., has been incorporated with a capital stock of $100,000, to carry on business as builders and contractors, with head office at Montreal. The incorporators are Frank Cunningham, real estate agent, W. G. C. Lanskail, accountant, and Arnold Wainwright, K.C., all of Montreal.

Wrightville Realty Limited, incorporated with a capital stock of $100,000, to carry on business as a general land and building company, with head office at Ottawa.' The incorporators are Dr. A. T. Shillington, J. K. Meredith and E. S. Church, merchants, all of Ottawa.

Metropolis Apartments Company, Ltd. has been incorporated with a capital stock of $250,000, to erect apartment houses and carry on business as contractors, etc., with head office at Montreal. The incorporators are D. E. Anthony, manager, C. H. Query, insurance broker, and H. J. Girard, bookkeeper, all of Montreal.

Frontenac Floor and Wall Tile Co., Ltd., has been incorporated with a capital of $250,000, to carry on business as manufacturers and dealers in wall tile of every description, with head office at Kingston. The incorporators are Dr. J. C. Connell, C. A. Macpherson and C. J. Warwick, manufacturers, all of Kingston.

Page & Company, Limited, have been incorporated with a capital of $250,000, to carry on business as a general land and building company, with head office at Toronto. The provisional directors are Walter Page, G. H. Kilmer and J. A. McAndrews, all of Toronto.

Realty Holding Company, Limited, has been incorporated with a capital of $300,000, to carry on the general business of a land and building company, with head office at Toronto. The provisional directors are A. D. Davidson, real estate commissioner, Cawthra Mulock, financier and Gordon Perry, manufacturer, of Toronto.

The Northern Veneer Company, Ltd., has been incorporated with a capital of $200,000, to manufacture and deal in timber, wood, lumber, shingles, woodworking machines and builders' supplies, with head office at Grimsby. The provisional directors are T. C. Haslett, W. F. McGiverin, and R. C. Ripley, accountants, all of Hamilton.

The Jasper Land Company, Limited, has been incorporated with a capital of $40,000, to erect buildings and deal in building material, with head office at Toronto. The provisional directors are W. A. Phillips, school teacher, W. D. Hay, insurance manager, and Dr. S. M. Hay, all of Toronto.

The Bay of Quinte Wood Company, Limited, has been incorporated with a capital of $500,000, to manufacture and deal in timber, lumber and wood of all kinds, with head office at Toronto. The provisional directors are C. E. Bailey, lumberman, A. M. Donovan, barrister, and W. F. Greig, law student, all of Toronto.

STEEL & RADIATION LIMITED
Products all Made in Canada
Toronto, Ont. Fenestra SOLID STEEL WINDOWS Montreal, Que.
Steelcrete Concrete Reinforcing
Steelcrete Metal Lath
Steelcrete Steel Lockers

MacLean Daily Reports Limited
The only systematic method yet devised for reporting BUILDING AND ENGINEERING projects from their inception to completion. Ask us for Rates and Specimen Reports.
220 King Street West - TORONTO

IF YOUR BUSINESS ISN'T WORTH ADVERTISING, ADVERTISE IT FOR SALE

FOR RENT COTTAGES
If you want a real holiday, plan to spend your vacation, this year in Muskoka where "the breezy call of incense breathing morn" will put new life in mind and body. Muskoka offers more real healthful enjoyment for less money than any other resort in the world.
Four cottages to rent $125 to $200 on Bohemia Island, less than a mile from Royal Muskoka Hotel and good Golf Links. Box 771,
Canada Lumberman
Toronto, Ont.

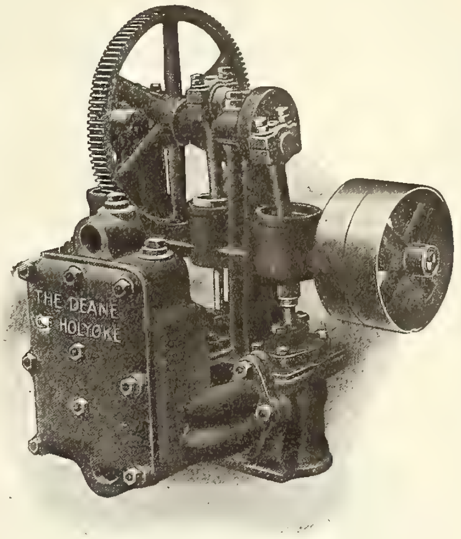
DEANE POWER PUMPS

ADMIRABLY ADAPTED FOR

HOUSE SUPPLY

BOILER FEEDING

TANK SERVICE



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CALEDONIAN IRON WORKS CO., LIMITED

Works: Seigneurs & William Sts., MONTREAL.
Manufacturers of Boilers, Castings, Condensers, Elevators, Engines, Filters, Forgings, Hydraulic Machinery, Pumps, centrifugal and reciprocating, Steam Turbines, Tanks, Water Wheels, Water Works Plants.

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WALL PLASTER

"Crown Brands"

TRADE MARK

CROWN

Pure Gypsum Products

Crown Gypsum Company, Limited

Lythmore - Ontario - Canada

BOILER AND STEEL PLATE WORK

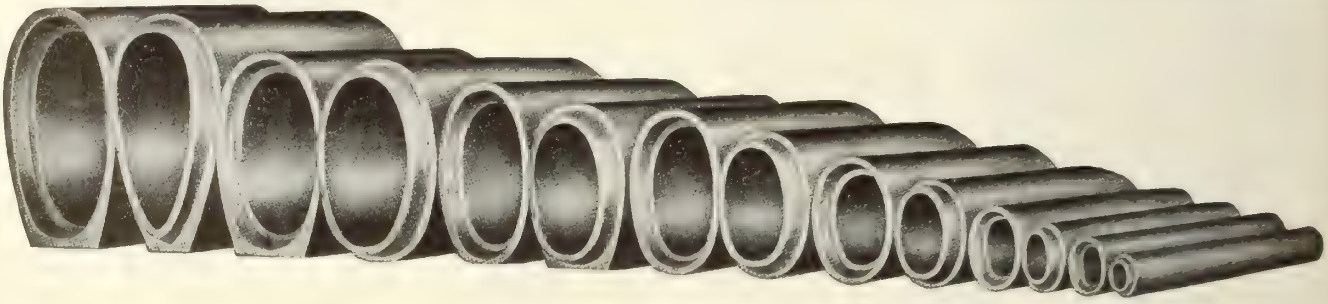
Of All Kinds

We are manufacturers of: Boilers, Steel Tanks, Smoke Stacks, Ore Buckets, Ore Cars, Steel Flumes, Etc. Any size or style.

Hoisting Machinery a Specialty

Let us quote on your requirements. *All Work Guaranteed.*

MARSH & HENTHORN, LTD., - Belleville, Ont.



Sewers and Culverts

properly built of properly made

- Reinforced Concrete Pipe -

LAST FOREVER.

OUR MATERIAL, SYSTEM and PRODUCT have been tested and approved by EMINENT ENGINEERS. NO RUST, NO ROT, NO FROST-BREAKS, NO PRESSURE-BREAKS, NO HIGH PRICES, NO DELAYS IN PROCURING, NO TROUBLE IN HANDLING.

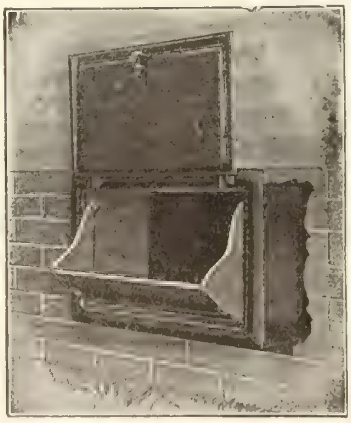
STANDARD REINFORCEMENT, or SPECIAL if required. Stock sizes 6 in. to 60 in.

Patronize Experienced and Reputable Manufacturers.

Catalogue and prices on application.

Dominion Concrete Company Ltd.

Kemptville, Ontario



EQUIP YOUR CELLAR

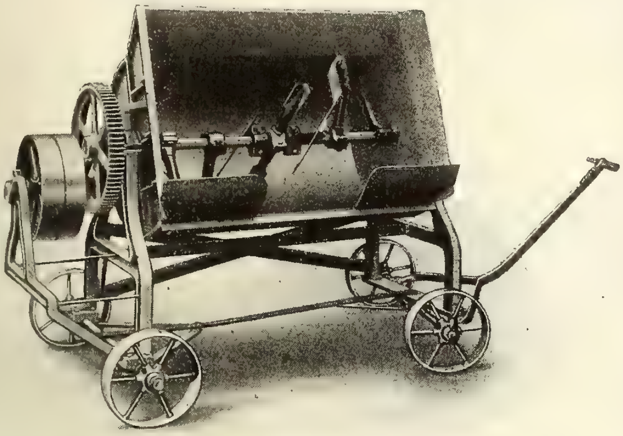
with one of our "Majestic" Coal Chutes which is the neatest and best equipment for any cellar. It is easily installed in either new or old houses. It permits coal, wood or vegetables to be put into the cellar without disfiguring the building in any way. And unlike a glass window it cannot be broken. The hopper can easily be removed if desired to put in very coarse coal or wood, or if a waggon chute is used. It swings back into the chute and allows the door to be closed. The door is made to lock when opened upward, and protects the wall or siding above the chute, and can be released only when closed. We make three standard sizes. There's a size that's just right for your cellar and your requirements. No. 1—22 x 16 x 13. No. 2—27 x 16 x 13. No. 3—33 x 22 x 18.

Send for our illustrated booklet, it shows and describes our full line of Coal Chutes

The Galt Stove & Furnace Co., Limited, GALT, ONT., CAN.

Toronto Representatives: Black Building Supply Co., Mail Building
Montreal Representative: E. F. Dartnell, No. 8 Beaver Hall Square
Gorman, Clancey & Grindley, Agents, Calgary and Edmonton, Alberta

The Mixer With a Record



THE BLYSTONE HAND TRUCK MIXER

For combination shop and outside use this Hand Truck Mixer is acknowledged to be the very best on the market. It has been used on hundreds of sidewalks and foundation contracts with unqualified success. It is strongly built and so simple in design that it will never give any trouble with repairs.

Strongly Made—Well Balanced **Easy to fill—Easy to Dump**

Send for Catalogue

The Blystone Machinery Company
61 Railroad St., CAMBRIDGE SPRINGS, Pa., U.S.A.

Full line of Blystone Mixers carried in stock by
The A. R. Williams Machinery Co., Limited, Toronto, Ont.
N. J. Dinnen & Co., Limited, Winnipeg, Man.
Gorman, Clancy & Grindley, Calgary, Alberta.
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"Metallic"

Skylights

Of all shapes and sizes, for all purposes. We can give you a better job and save you money on any skylight. Our equipment for doing this work is the most modern and complete in Canada. Write for catalogue "Z" covering Skylights, Ventilators, Cornices, etc.

Hollow Metal Construction
Plain or Wired Glass.

THE METALLIC ROOFING CO.
OF CANADA LIMITED,
TORONTO AND WINNIPEG

Contractors' Acetylene Flare Lights

Made in Two Sizes

SIZE NO 1—

8,000 Candle Power, operates 12 Hours on 18 lbs. Carbide.

Price F.O.B. Ottawa $95.00.

SIZE NO. 2—

1,000 Candle Power, operates 12 Hours on 8 lbs. Carbide.

Price F.O.B. Ottawa $65.00.

Manufactured by

International Marine Signal Co. Limited
Ottawa, Canada

Used Machinery and Contractors Plant

FOR SALE

40—4 Yard Dump Cars 36″ Gauge (at a Bargain)
1—70 Ton Vulcan Steam Shovel
1—5 Ton Tandem Roller
1—Gasoline Tractor 12 Ton Capacity
1—9x16, 39 Gauge Porter Locomotive, 12 tons
1—Ledgerwood Cableway, 1450 Feet
1—40 foot Steam Yacht
1—No. 5 Champion Stone Crusher
1—10 Ton Stiff Leg Derrick
1—7x12 Marsh & Henthorn Hoist D. D. and Swinger.
1—35 H.P. Locomotive Type Boiler
1—30 H.P. Locomotive Type Boiler
1—1/2 Yard Smith Concrete Mixer
1—12x16 Waterous Stationary Engine
1—7x12 Beatty Hoist D. D. and Swinger.

The above machines are but slightly used and are in good working order.

Fleming Machinery Company
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NEPONSET

Waterproof Building Paper

Made scientifically of only highest grade material and its quality never fluctuates—positively waterproof.

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Engineers, Boilermakers, Machinists, Founders

Manufacturers of

Emerick Ball Pulverizers, Emerick's Separators, Vibrating Screens, Tube Mill Feeders, Cement Manufacturing Machinery, Rotary Kilns, Ball and Tube Mills, Engines and Boilers, Dump Cars, Smoke Stacks and Tank Work, Grey Iron and Brass Castings, Heaters and Purifiers

Special attention given to Cement Mill Machinery Repairs, Cleaning and Welding Boiler Tubes

Steel Plate Work, STRUCTURAL STEEL and Municipal Bridge Work

We solicit an opportunity to tender on any work in the above lines

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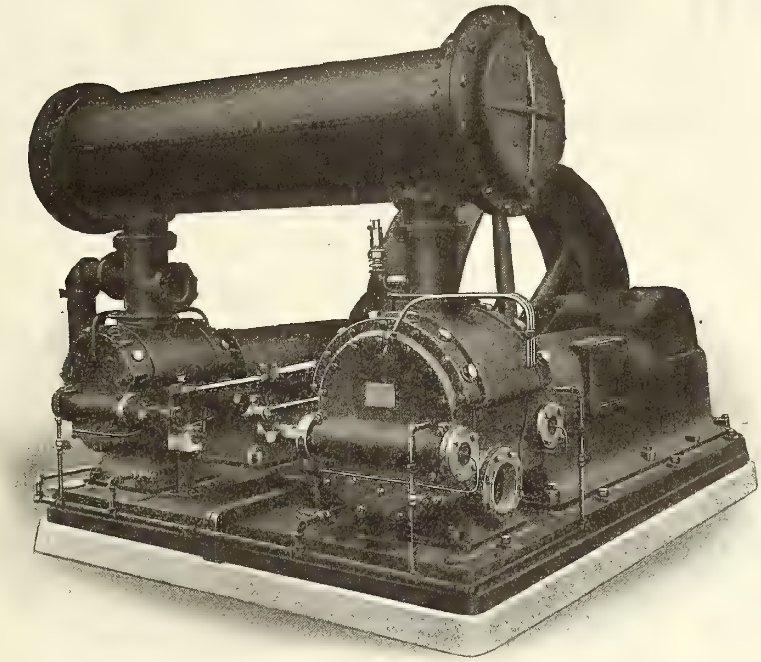
AIR COMPRESSORS



Durable **Reliable** **Efficient**

All principal bearing surfaces are provided with flood lubrication, thus insuring freedom from trouble and resulting in absolute reliability of service.

See Bulletin 42

CANADIAN ALLIS-CHALMERS
Limited

THE McKIERNAN-TERRY

HAMMER DRILL

is the accepted tool for real economy in sinking a shaft. No matter if the rock is wet or dry a "BUSY BEE" HAMMER DRILL is the one for the work. Less labor, less power and less expense than with any other type of drill. It is the only drill you can afford to use for shaft sinking.

Send for our "BUSY BEE" Hammer Drill Bulletin.
It gives full particulars.

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Head Office : King and Simcoe Sts., TORONTO

Dark Hollow Gray

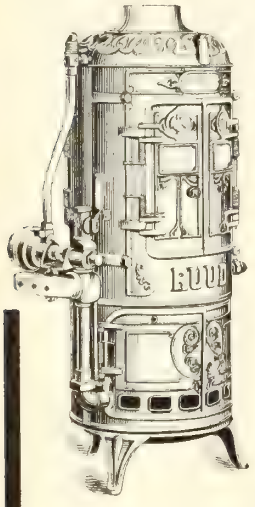
Bedford Stone

Has **character** and **individuality** not found in any other Indiana Limestone, its distinguishing features appeal to discerning architects.

SPECIFY IT!

The Consolidated Stone Company

BEDFORD, Indiana



Turn the Faucet—The "RUUD" DOES THE REST

Hot water when you want it—any time—all the time—one bath—a dozen baths or just enough for the toilet and shaving, without any waste of fuel. Ever ready hot water for every purpose—always ready for any emergency. And all this comfort and convenience with but a single thought—"just turn the faucet". This is the kind of service that is wanted in every home, and every home owner, builder or contractor should consider it. Always at hand—day in and day out—year after year and inexpensively obtained if you have the **Ruud Automatic Gas Water Heater.** See that a **Ruud** heater is specified for that new house.

The Consumers' Gas Co.

12-14 Adelaide Street West
Telephone Main 1933

Pioneer Manufacturer of

Hotchkiss Steel Forms

For walks—curbs—curb and gutter combined—driveways, roads, pavements, etc.
The benefit of 20 years experience as successful contractors.

Yours for the Asking

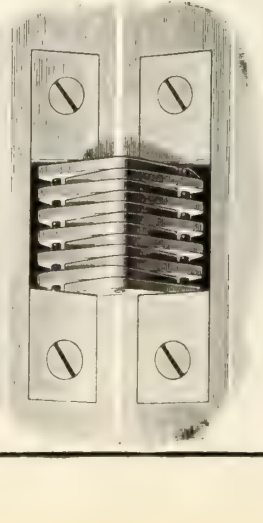
Hotchkiss Lock Metal Form Co.
BINGHAMPTON, N.Y.

Tenders Wanted

should be advertised for in the "Tenders and For Sale Department" of the CONTRACT RECORD AND ENGINEERING REVIEW. This paper is the "Tender Ad." medium of Canada and always brings bids from the reliable contractors and supply houses.

File your plans for any work on which you are inviting bids, in our offices at Toronto, Montreal, Winnipeg or Vancouver.

ContractRecord
and Engineering Review
Toronto Ontario



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—*Furnishing World*

Invaluable to—
Piano Manufacturers
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Neat and Strong
Write for Booklet

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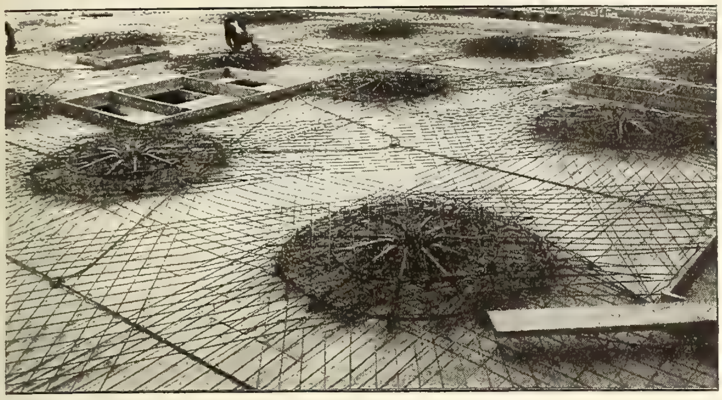

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Get Maximum Efficiency From Your Concrete Reinforcing

When the concrete is compressed in several directions, the compression in one direction tends to off-sett that in another. This fact permits the use of a minimum amount of concrete with high efficiency in the steel in the mushroom system

The multiple way reinforcing more than doubles the crushing strength of the concrete

MUSHROOM SYSTEM Reinforced Concrete

A system that assures ECONOMY and RAPIDITY of construction together with DURABILITY and LOW MAINTENANCE.

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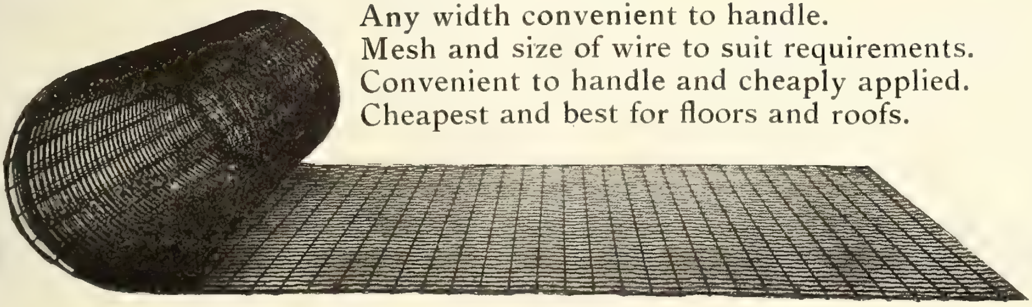
Steel Wire Reinforcing

Continuous lengths.
Any width convenient to handle.
Mesh and size of wire to suit requirements.
Convenient to handle and cheaply applied.
Cheapest and best for floors and roofs.



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WIRE LATH

MANUFACTURED BY

The B. Greening Wire Co. Limited
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WATER WORKS CONTRACTORS

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WOODEN WATER PIPE

For water works systems, domestic water supply and hydraulic mining. Insulated wire conduits; steam pipe casings; acid-proof pipe for mines, tanneries and pulp mills. Sizes from 2 inches to 24 inches.

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STEEL MERCHANTS
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MANUFACTURERS AND CONTRACTORS FOR

Steel Railway and Highway Bridges, Steel Frame and Mill Buildings, Structural Steel and Plate Work of any description.

Capacity 9000 tons per annum.

Shop is equipped with High Speed Electric Cranes and Modern Heavy Duty Tools, Can handle single pieces structural work of 40 tons.

Large Stock of Beams, Channels, Angles, Tees, Plates, etc., for prompt shipment.

Stock yard runway 800-ft. long, crane 70-ft. span.

Shipping runway 400-feet long, crane 80-ft. span.

Delivery yard runway 120-teet long, cranes 40-ft. span.

Orders and Inquiries Solicited

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Spadina Avenue Dock
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Water Washed Sand
Pit Sand
Screened Gravel
Pit Run
Crushed Limestone
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OUR plants at AYR and TORONTO are the most modern in the country and our materials are the best that can be produced.

Call Adel. 1947 and we will be pleased to give you all information regarding prices and deliveries.

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Manufacturers

Flexible and Flange Pipe, Special Castings and all kinds of Waterworks Supplies.

CAST IRON PIPE

3 inches to 60 inches diameter

for Water, Gas, Culvert and Sewer

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Head Office:
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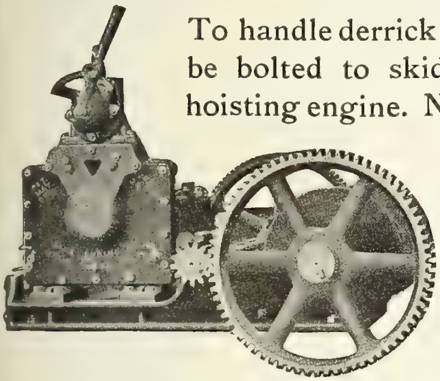
Iron Ore, Pig Iron, Car Wheels, Cast Iron Water and Gas Pipe, Specials, Valves, Hydrants, etc., Castings of all kinds, Mooring Bollards for both Concrete and Wooden Docks, Hoisting Machinery.

The Dake Swinging Gear



To handle derrick booms. Can be bolted to skids in front of hoisting engine. No dead center.

Start, Stop, Reverse at Will

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Dake Engine Co.
Grand Haven, Mich.

When you want stone that appeals specify

"Queenston Blue" Limestone

Send us your specifications for Cut Stone work

The Queenston Quarry Co., Ltd.
ST. DAVIDS, ONT.

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The Ready Mixed
Hard Wall Plaster

Manufactured by

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100 Bleury Street - - MONTREAL

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Conduits

for Interior Construction

Conduits Company, Limited
Sole Manufacturers under Canadian and U. S. Letters Patent
Toronto - Canada

CAWTHRA MULOCK, President - - GORDON F. PERRY, General Manager

NATIONAL IRON WORKS, Limited

LARGEST MANUFACTURERS IN CANADA OF

every size for Water, Gas, Culvert or Sewer, Carried in Stock

Lake or Rail Shipments **Offices, Works and Docks, TORONTO**

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SMYTH & RYAN

for quotations on

Lime, Stone, Cement, Sewer Pipe, Fire Brick, Weeping Tile, Mortar Colors, Plaster, &c.

Toronto Agents for

OWEN SOUND CRUSHED STONE

Deliveries G. T. R. and C. P. R.

Head Office, 1327 Bloor Street West

Phones, Junc. 828,829.

Branch Yards, 53 Merton Street

Phone, North 4751 G.T.R. Belt Line

Night and Sunday calls, Phone, Parkdale, 2198.

RAILS New and Relaying Switches, Turntables, Etc.

Carried in Stock

Locomotives and Cars

Jno. J. Gartshore, Toronto

"EBANO" and "EAGLE" Brands

MEXICAN ASPHALT

HERKIMER ST., HAMILTON. Paved with our Mexican Asphalt.

Write for analysis and samples

The

Asphalt & Supply Company, Limited

Sole Canadian Agents for the Mexican Eagle Oil Co.
Also Agents for MASTIC ASPHALT for Sidewalks.

428 Transportation Bldg., MONTREAL

460 feet x 8 feet 2 in.

World's Largest Chimney

Radial Brick chimneys are the only type that will not deteriorate from the effects of gases and erosion.

HEINICKE CHIMNEYS

will be found proving their superiority to over 4,000 users in every part of the country. The day of common brick and metal stacks is gone—if you are building a chimney make it a HEINICKE.

Write for catalogue

H. R. HEINICKE, INC. New York, U. S. A.

Representatives for Canada:
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Dartnell Ltd., Montreal, Que.

Cap. 75000 gals. Height 85-ft.
Canadian Car and Foundry Co., Montreal

Canadian Plant

Chicago Bridge & Iron Works

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Our Specialty is the Design, Manufacture and Erection of ELEVATED STEEL TANKS for Municipal, Railroad and Factory Service.

We also design, manufacture and construct Oil Tanks, Coaling Stations, Bridges, Turntables, Buildings and Structural Material.

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SHOPS—BRIDGEBURG, ONT., CAN.
Chicago, Ill., U.S.A.
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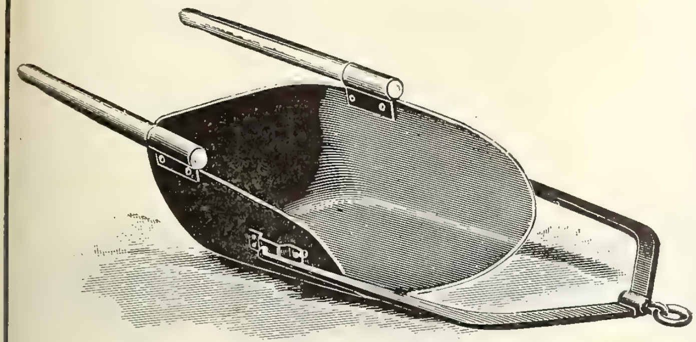
Grand Trunk Pacific Ry.
Lines West of Winnipeg

The Best Value for Your Money



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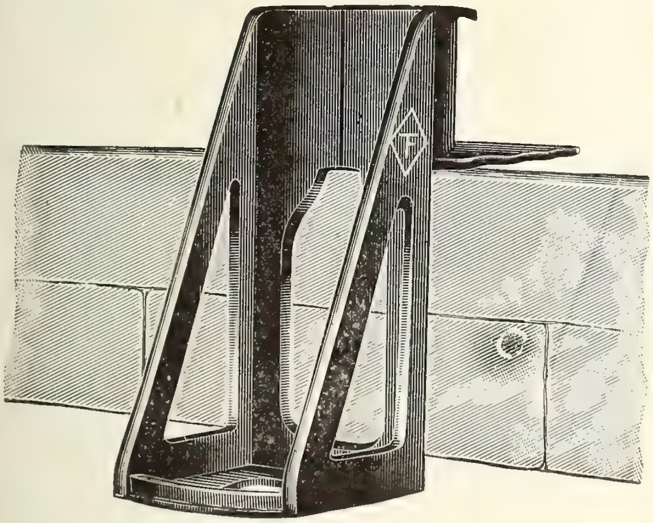

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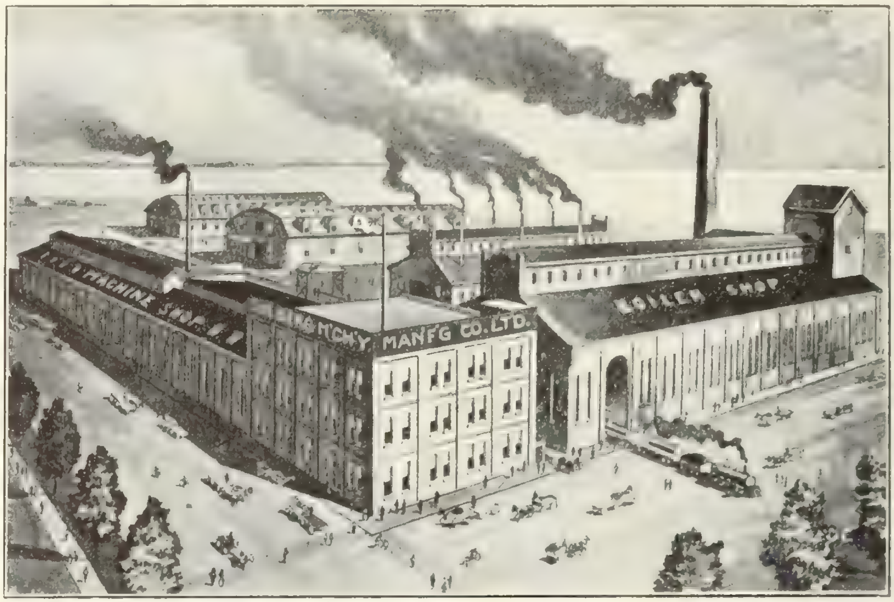

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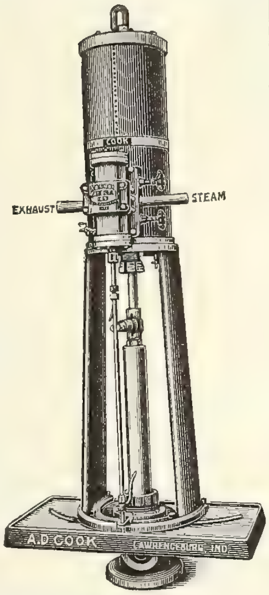

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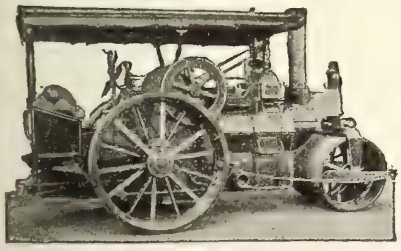

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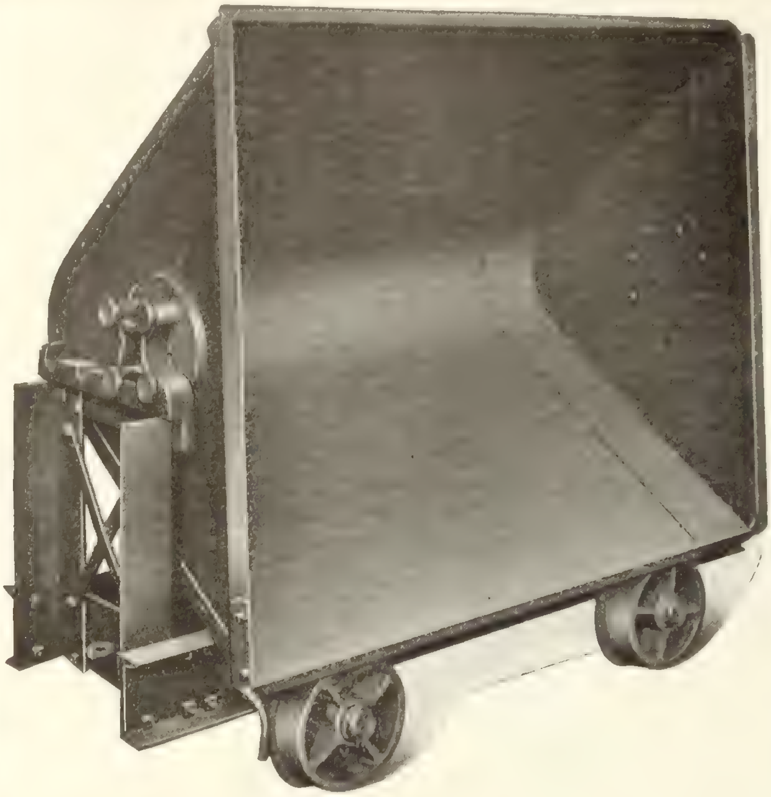

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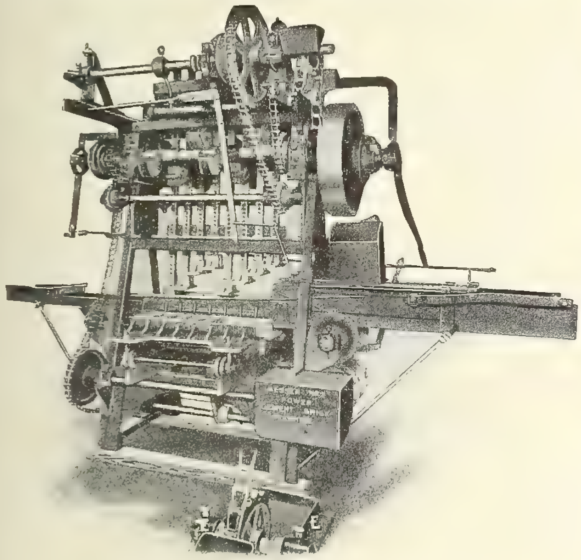

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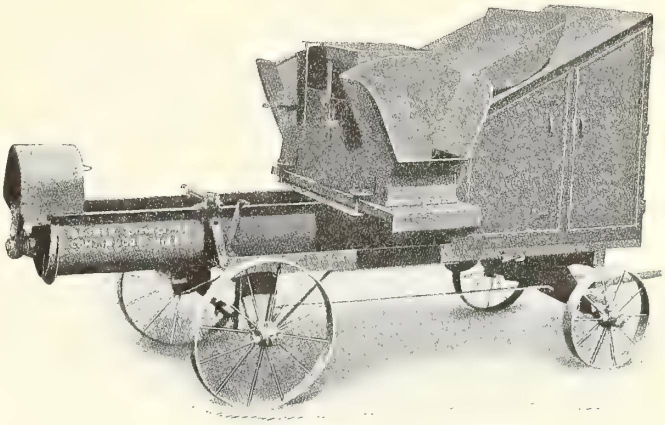

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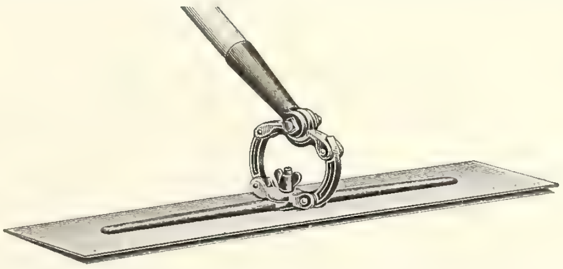

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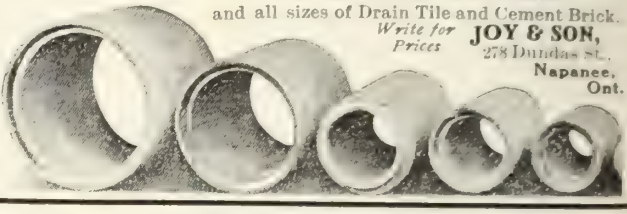

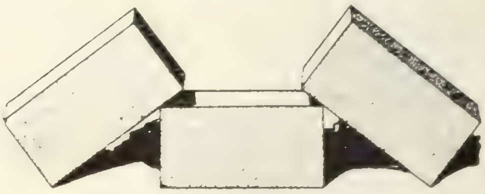

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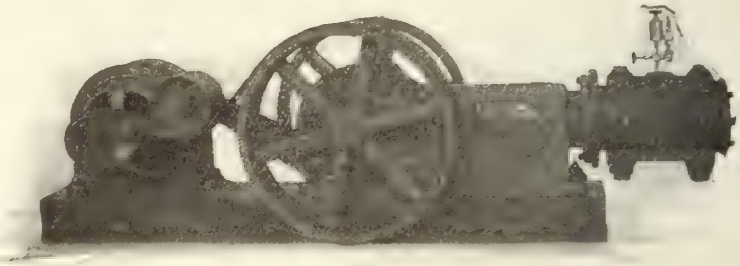

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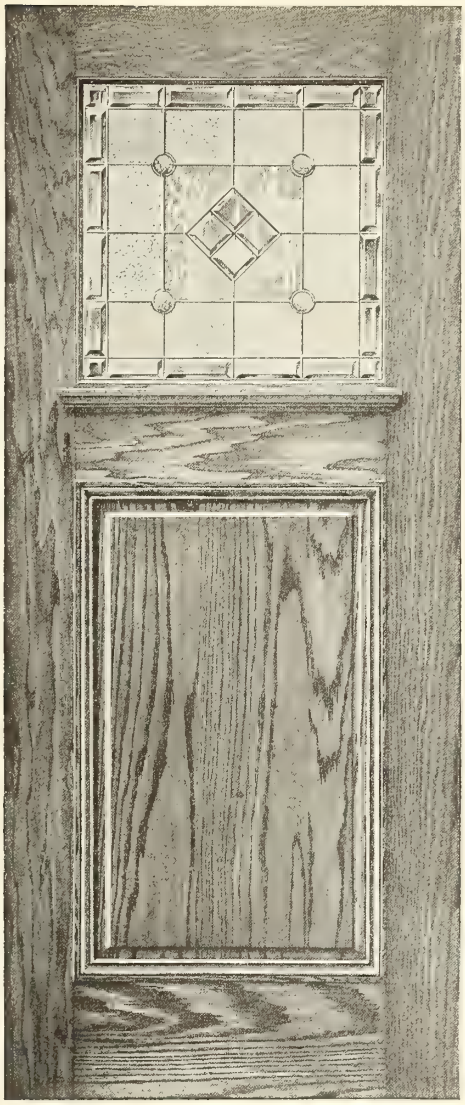

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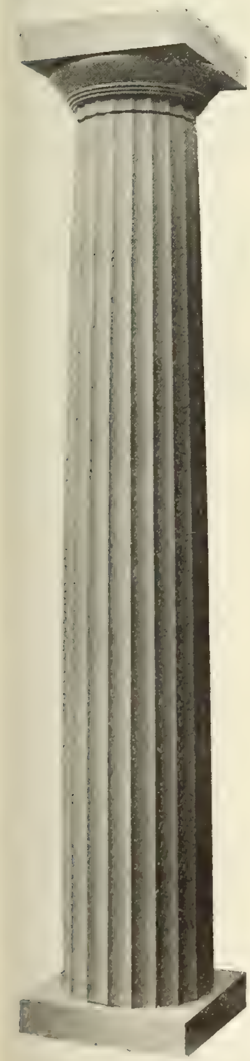

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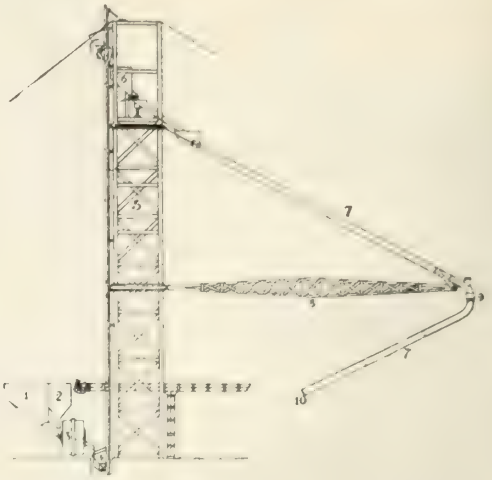

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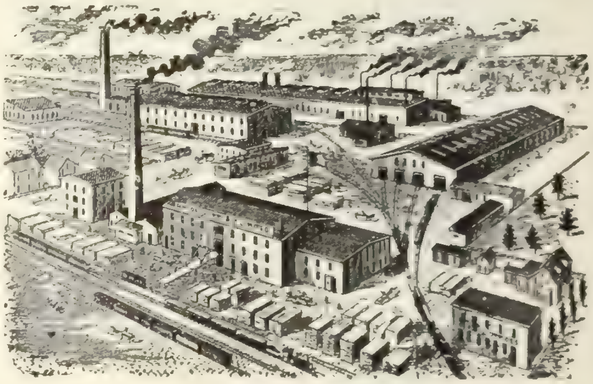

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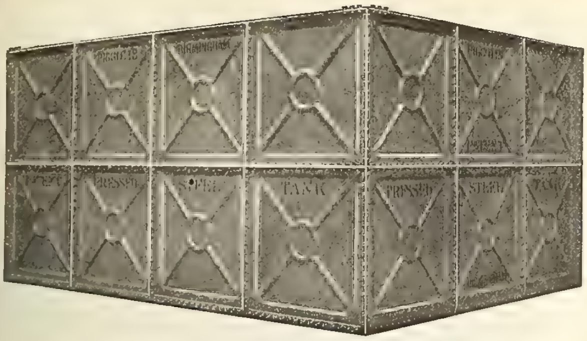

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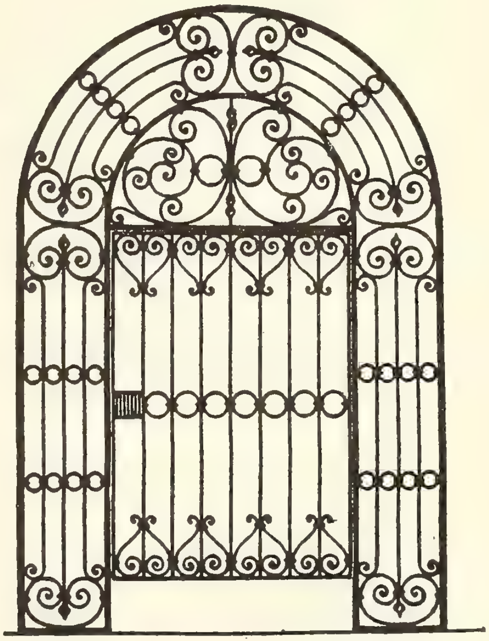

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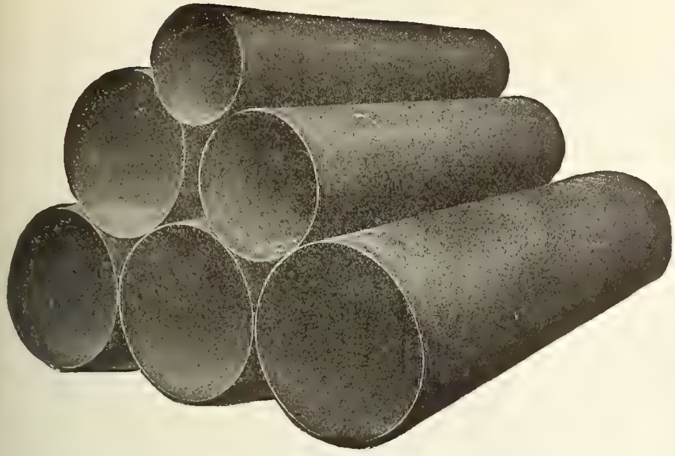

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"TAMCO" Crushed Stone in all sizes, for all purposes.
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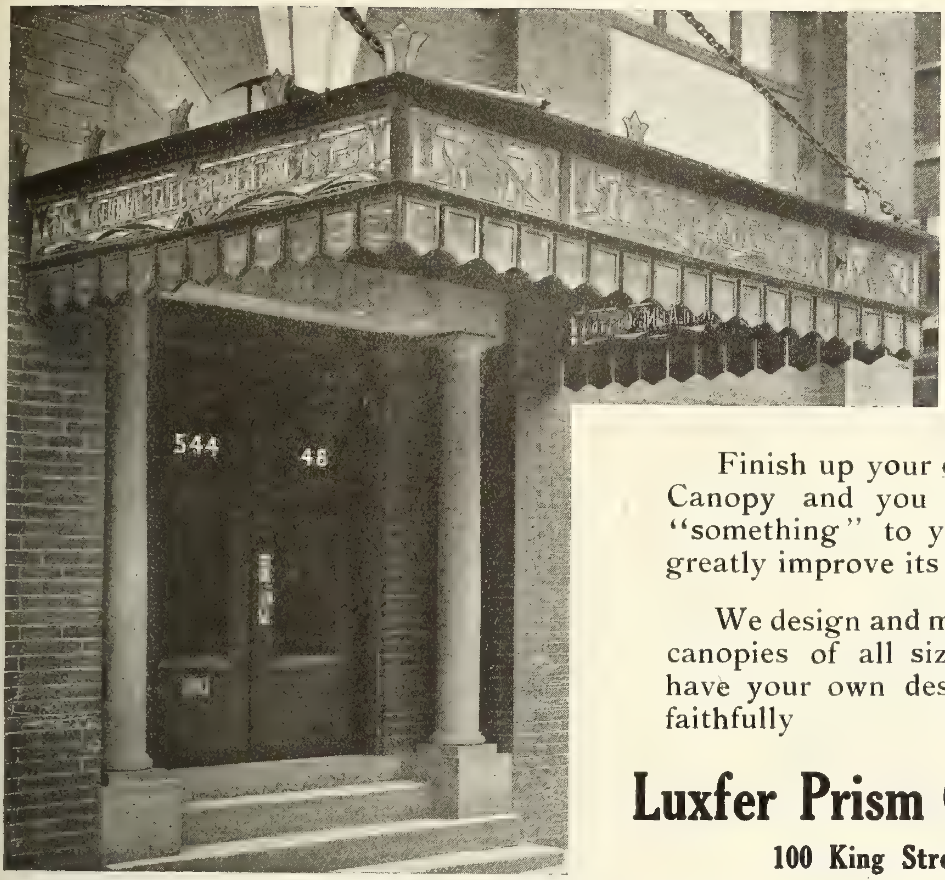

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Finish up your entrance with a Luxfer Canopy and you will add a distinctive "something" to your building that will greatly improve its appearance.

We design and manufacture leaded glass canopies of all sizes and styles. If you have your own design we will execute it faithfully

Luxfer Prism Company, Limited
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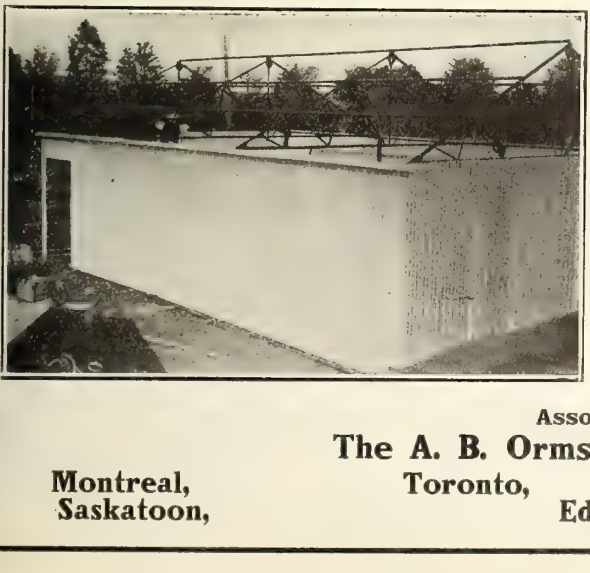
Storage Houses Oil Houses

¶ We have the best possible facility for making all kinds of storage houses of one storey, no matter of what dimensions.

¶ We will undertake to furnish and erect such buildings complete ready for occupancy.

¶ No steel building is too small or too large for us to figure on.

¶ We shall be pleased to furnish estimates and sketches on this class of work at any time. Write us and tell us what you need and we will prepare estimates for you at once.



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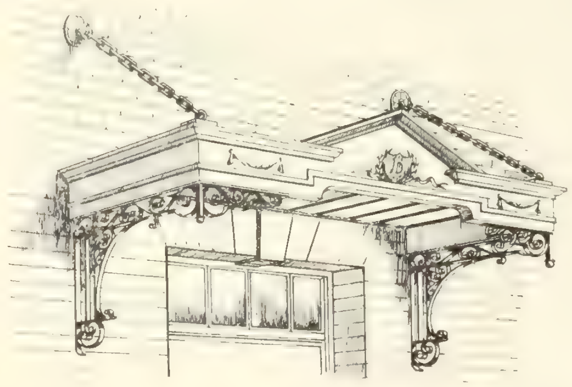

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SOLE producers of the Beautiful Royal Dominion marble quarried at South Stukely, Que. A card or 'phone call will bring our representative to submit figures on any class of marble work. Address all letters to the Company P.O. Box 1166, Montreal.

NOTICE TO OUR CUSTOMERS

¶ Please take note that our mills and Head Office are now located in Lyster, Megantic Co. where all correspondence should be addressed, and orders as in the past will be attended to promptly.

Lyster Wood Box Turning Enamelling Company, Limited

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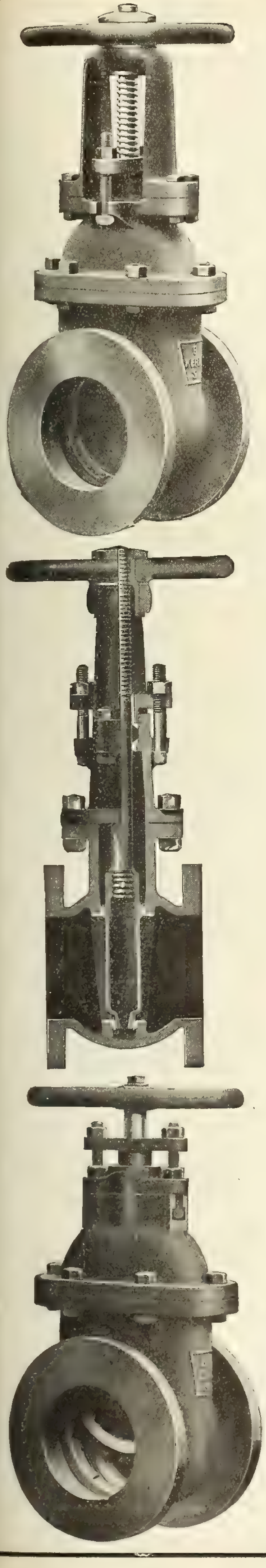
Successors to Automatic Wood Box & Turning Co., St. Romuald, Que.



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Iron Body GATE VALVES

are not surpassed by any other gate valve in **Design, Quality** of material, **Durability, Workmanship,** and up-to-the-minute requirements.

They have been designed and are built to meet the specifications of the most exacting and critical Engineers, and will bear the rigid scrutiny of "THE MAN WHO KNOWS."

If you are particular about the valves you specify or buy, you will not only **specify, but demand Kerr (Keystone) Iron Body Gate Valves.**

Any **Kerr Valve** lends class and distinction to any steam or water job.

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exclusive output.

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Bay State Brick and Cement Coating

"LIGHTS LIKE THE SUN"

It reflects the light in the darkest rooms and will cut down your lighting bill.
Can be washed, and will not chip off when applied over delicate machinery.
It is a fire retarder, and when used on wood work lessens the fire risk. Bears the label of the National Board of Fire Underwriters. Can be used equally well in the damp or dry rooms of your mill or factory. Is impervious to moisture or fumes.

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Current Prices of Building Material

BRICKS

The following are wholesale prices delivered at Toronto:—

	Per M
No. 1 dry pressed red brick	$18 00
No. 1 dry pressed buff brick	18 00
Red Stock Bricks	13 00
Grey Stock Bricks	13 00
Wire cut bricks for foundation work	12 50
Porous terra cotta bricks	15 00
No. 1 enamelled bricks, all colors, from	$80 00 to $150 00
Sand-Lime Bricks	11 00

LUMBER (Building Material)

Hemlock Lumber—

2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$27 00	
2 x 4 to 2 x 12, 16 ft.	27 00	
2 x 4 to 2 x 12, 18 ft.	30 00	
1 in. Hemlock, No. 1	26 00	28 00
No. 1 Hemlock Decking	26 00	28 00
No. 2 Hemlock dimension and 1-in.	20 00	22 00

Pine—

1 in. common pine 8 to 12 in. wide rough	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
⅞ x 8 and 10 in. pine shelving	36 00	42 00
⅞ x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine desking D2S	30 00	
Spruce Decking	28 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

Pine trim for paint finish—

4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8-in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

Shingles—

XXX B. C. Clear Shingles, per M.	3 90
N. B. Extras	3 75
N. B. Clears	3 10
No. 1 pine lath, per M.	5 00
No. 2 pine lath	4 50
No. 1 spruce lath	4 00

Cedar Posts—Fence—

5 in. at small end, each	30
7 in. at small end, each	35
Hemlock lath	3 50

Dimension Timber up to 32 feet:

8x8, 10x10, 10x12, 12x12, 12x14	32 00
8x10, 8x12, 10x14, 14x14	34 50
8x14, 12x16, 14x16, 16x16	34 50
10x16, 14x18, 16x18	35 50
8x16, 12x18, 18x18	36 00
10x18, 14x20, 16x20	36 50
8x18, 12x20, 18x20	37 00
10x20	37 50
8x20, 14x22, 16x22, 18x22, 20x22, 22x22	38 50
12x22	39 00
10x22	39 50
8x22, 14x24, 18x24, 20x24, 22x24, 24x24	40 50
12x24	41 00
10x24	41 50
8x24	43 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

	Star	D.D.
10 to 25 united inches	$4 25	$ 6 25
26 to 40 "	4 60	6 75
41 to 50 "	5 10	7 50
51 to 60 "	5 35	8 50
61 to 70 "	5 75	9 75
71 to 80 "	6 25	11 00
81 to 85 "	7 00	12 50
86 to 90 "		15 00
91 to 95 "		17 50
96 to 100 "		20 50
101 to 105 "		24 00
106 to 110 "		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for box lots:—

MONTREAL

	Star	D.D.
25	$3 25	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
90		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 u.i.	$3 50	$5 00
26/40	3 75	5 50
41/50	4 25	6 25
51/60	4 75	7 00
61/70		8 00
71/80		9 00
81/85		10 00
86/90		11 00
91/95		13 00
96/100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

STEAM FITTERS' AND PLUMBERS' SUPPLIES

Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock ...... net $1.85

No. 4½ Fuller's .... net $2.50

Square head brass cocks, 65 per cent.

Lead Pipe

Lead pipe, $7.50, less 5 per cent.; lead waste, $9.00, less 5 per cent.; caulking lead, 7 cents per lb.; traps and bends, 40 per cent.; pig lead, 5¾ cents per lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.28	¼ inch	$3.18
⅜ "	2.28	⅜ "	3.18
½ "	2.72	½ "	3.57
¾ "	3.28	¾ "	4.43
1 "	4.85	1 "	6.55
1¼ "	6.56	1¼ "	8.86
1½ "	7.84	1½ "	10.59
2 "	10.55	2 "	14.25
2½ "	16.67	2½ "	22.52
3 "	21.80	3 "	29.45

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

Soil Pipe and Fittings

Medium and extra heavy pipe and fittings, up to 6-inch, 60 and 5 per cent.

7 and 8-inch pipe, 45 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

CEMENT, STONE, STEEL, Etc.

Cement, barrel lots, in bags, delivered Toronto, bags extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ⅜-inch, $1.45.

Burnt River rubble stone delivered, $17 to $18 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¾ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

Free stone delivered, $17 to $18 per toise.

Brown coursing stone, delivered, $3.75 per yard.

Grey coursing stone, delivered, $2.50 to $2.75 per yard.

Sand, for cement or brick work, $1.15 a cubic yard, f.o.b. Toronto, C. P. R. sidings.

Sand, for cement or brick work, 90c to $1.05 a cubic yard, f.o.b. Toronto, G. T. R. sidings.

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

Steel channels and beams, angles and plates, $2.65 to $3.00 per 100 pounds, delivered f.o.b. Toronto.

Hard Wall Plaster, unsanded, from $7.00 to $8.50, bags extra; sanded, $4.00 in car lots; hydrated lime, $10.00 in car lots.

Lime per cwt., delivered, not less than 1,500 lbs. 33 cents; white, 43 cents.

Plaster of Paris, Anchor and Crown Brands, $1.50.

Manilla Rope, best, per pound, 12½ cents.

PAINT AND OILS

Pure White Lead, ground in oil, $9.00 per 100 lbs.

Boiled Linseed Oil in bbls., 64c per gal of 9 lbs.

Raw Linseed Oil, in bbls., 61c per gallon.

Turpentine, in barrels, 56c per gallon.

Pure Red Lead, dry $7.00 to $8.00 per 100 lbs.

Putty, pure linseed oil, in bulk, bbls. 3½c.

Putty, pure linseed oil, in 25-lb. tins, 4c.

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MARBLES

Which are open for inspection at all times
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Any Request to Submit Tenders Will be Given Prompt Attention.

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Competition is met and profitable contracting achieved by the use of up-to-date equipment in every branch of the contracting business.

When it comes to digging let your men do more efficient work by supplying them with "Lundy" or "Dandy" shovels.

They enjoy a national reputation for rigid construction and durability.

We will send to any contractor, free, express prepaid a sample shovel. Send for our illustrated catalogue showing our full line of Shovels, Spades, Scoops, Draining Tools, etc.

THE LUNDY SHOVEL & TOOL CO., LTD.

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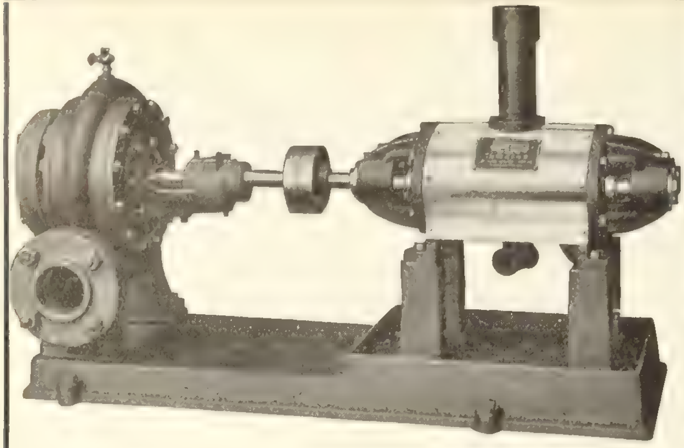
TEES & PERSEE OF ALBERTA, LTD., CALGARY ; E. E. CRANDALL, VANCOUVER, B.C.



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The remarkable performance of the Spiro turbine as applied to centrifugal pump drive, merely proves the old truth about the cardinal virtue of simplicity.

A gas producer yields a horsepower from the smallest quantity of coal, yet a steam operated Spiro-Centrifugal pumps a gallon of water at a much smaller total cost, figuring attendance, depreciation, investment and fuel combined.

Over and above this, the Spiro-Centrifugal has set up a new standard in continuity of operation, and by its almost total absence of repair cost.

"Buffalo" SPIRO-CENTRIFUGAL PUMPS

No one dreamed that a pair of plain herring-bone gears could be made into an engine or turbine before the advent of the Spiro. This new principle is revolutionary and has reduced prime mover construction to what would seem the limit of simplicity, service and economy combined. Not a single blade, nozzle or valve in the entire unit. Just a pair of herring-bone gears enclosed in a cylinder, with a jet of steam blown against them.

Ask for new 84-page catalog No. 225, and investigate the wonderful adaptability of the Spiro for direct connection to Pumps, Fans, Generators and machinery used in mining, quarrying and other pursuits.

Buffalo Steam Pump Co.

Sole Canadian Agents—

CANADIAN BUFFALO FORGE CO.
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"DEHYDRATINE"

For Water-proofing under the membranous method.

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For Water-proofing Concrete.

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For Surface Hardening Concrete Floors.

"SYMENTREX"

A Cement Coating—Makes Surfaces Water Shedding.

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Minerva House, - Toronto
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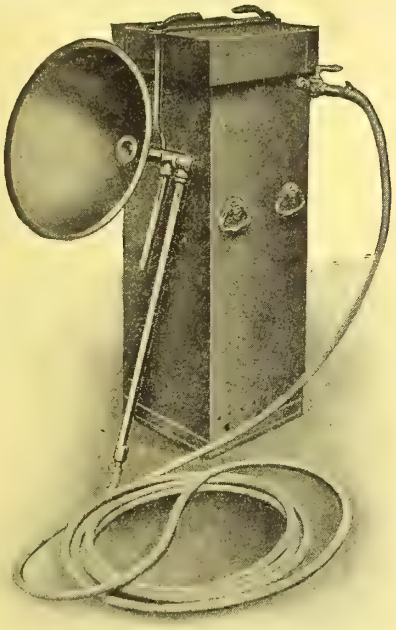
5,000 to 12,000 Candle Power at 5 cents Per Hour

How is that for cost? Can you beat it with any other light? The Milburn Acetylene Light is cheaper than oil or arc lights and just as simple as gas in your own house.



The Milburn Light shown here has a 15-inch aluminum, non tarnishing reflector, with absolutely storm-proof burner on swing joint, and 25 feet of armored hose and connections. It has a water-tight cover and is made to withstand hard usage, the vibration and movement of wrecking cars, cranes, steam shovels, dredges, etc. The light follows the crane or shovel and throws its rays directly upon the work.

THE MILBURN LIGHT

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Ask for Catalog No. 15.

The Canadian Fairbanks-Morse Company, Limited

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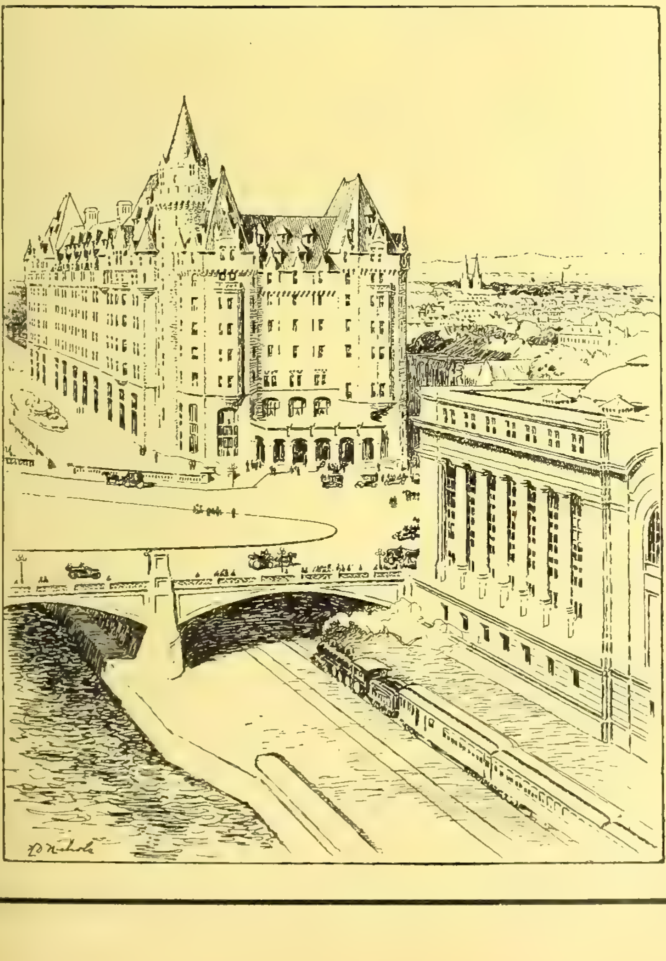

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This picture shows

Chateau Laurier and Grand Trunk Central Station, Ottawa

These buildings were wired throughout with "Adanac" Rubber Insulated Wire.

Architects: Ross & McFarlane, Montreal.
Engineers: Westinghouse, Church, Kerr & Co., New York.
Electrical Contractors: Western Electric Co., New York.

Address our nearest office. **Montreal, Toronto, Winnipeg**

Alberta and British Columbia enquiries may be addressed to our Sales Agents, Northern Electric & Manufacturing Co., Limited, Calgary and Vancouver.

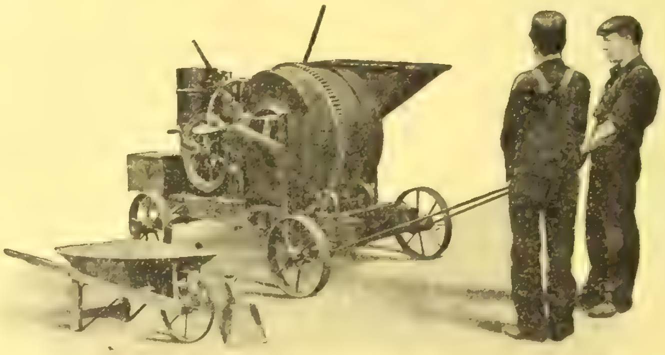
Everybody Who Builds

Concrete Walls, Concrete Walks or Curbs, Concrete Anything

can have the best Concrete that can be made at the least possible cost

BECAUSE

Our No. 4 RANSOME MIXER



No. 4 Ransome Concrete Mixer.

is the equal of our larger machines in efficiency and is sold at a price which makes it an easy and a wise purchase for anybody.

It has a batch capacity of 4 cubic yards per hour, which is ample for any small concrete job. No. 4 Mixers are sold in one way only : i. e.—mounted on Trucks, with gasoline engine, direct drive. This is a powerful engine for its rated H. P. and the best designed—a most perfect operating engine.

The No. 4 Ransome is a great time saver in every respect. As we equip these machines with a special batch charging hopper, which is being filled while the batch in the drum is mixing—no time is lost in charging drum. By the simple lever arrangement, the whole unmixed batch is fed into the drum in an instant and the loading gang keeps right on with their work without any waits whatever. The batch is instantly discharged by merely reversing the discharge chute.

Let Us Send You Particulars

F. H. Hopkins & Co.

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ESTABLISHED 1886

Contract Record and Engineering Review

Vol. 27 Toronto, August 20, 1913 No. 34

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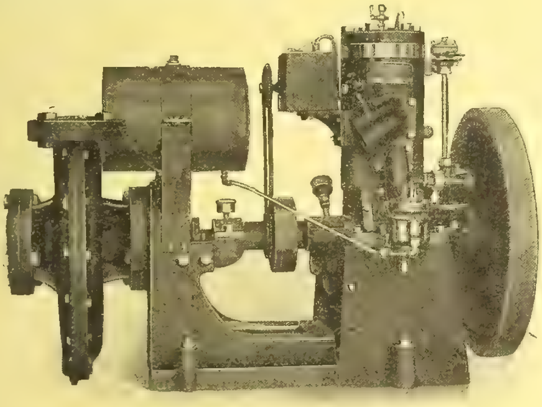

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HAMILTON, CANADA

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Made in all Kinds of Glass on Short Notice

Large Bent Plate Glass for Shop Fronts a Specialty

The Toronto Plate Glass Importing Company, Limited

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PILE DRIVERS

- —Prove the Value of Experience.
- —Utilize all the Energy.
- —Have Standard Mechanism.
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Canadian
Ingersoll-Rand
Co., Limited
MONTREAL, CAN.

Continuous and Machine Banded Wood Stave

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for city and town Water Systems, Fire Protection, Power Plants, Hydraulic Mining, Irrigation, etc. One-half the cost of Iron Pipe— and better.

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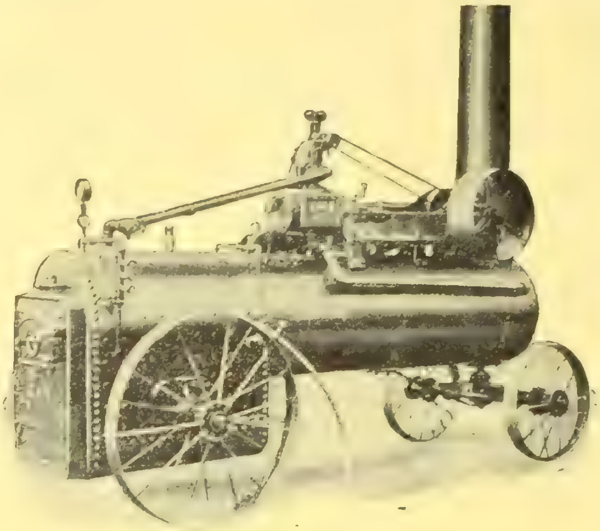
Full Particulars and Estimates Furnished



Portable Power Plants

The cut shows one of our compact and *portable* power plants for driving Crusher Outfits, etc. A complete power plant in itself—durable and efficient. We build different sizes and can meet your requirements precisely.

Contractor's Supplies

We also build Boilers, Air Compressors, Engines, Derrick Engines, Hoists of all kinds, Crushers Screens, etc.

Any of our offices will gladly furnish catalogs and particulars.

THE JENCKES MACHINE COMPANY, LIMITED

Sherbrooke St. Catharines Montreal Cobalt South Porcupine Vancouver Nelson

CROWD IT

RUSH IT — JAM IT

UP WITH WORK——THERE'S NO DANGER OF THE

"AMERICAN" Hoisting Engine

"LAYING DOWN"

IT STANDS FIRM UNDER THE HARDEST DUTY
IT PULLS TO THE LIMIT
IT'S THE ENGINE WITH THE PERFECT FRICTION

If you need EXPERT ADVICE regarding Hoisting Engines, write us

American Hoist & Derrick Co.

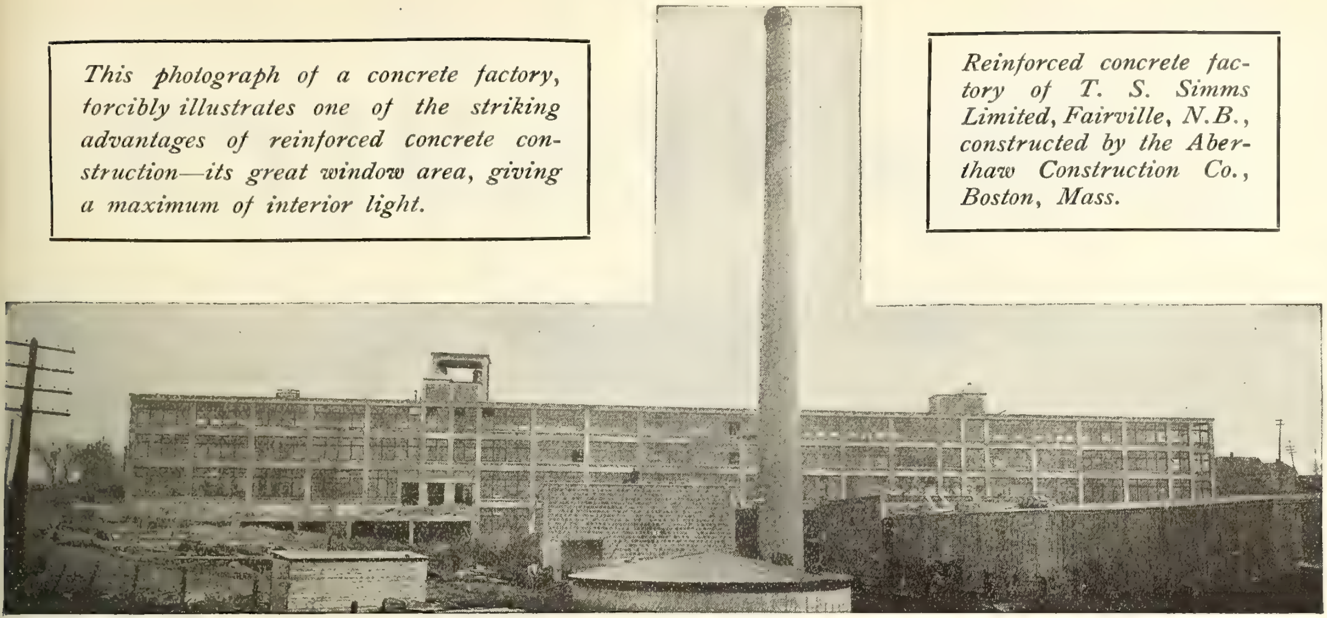
ST. PAUL, MINN., U. S. A.

Gorman, Clancey & Grindley—Edmonton and Calgary, Alta. and Nelson, B. C
Vancouver Machinery Depot, Ltd.—Vancouver, B. C.
Stuart Machinery Co.—Winnipeg, Man.
General Supply Co. of Canada, Ltd.—Montreal, Ottawa, Toronto, Canada.

"AMERICAN" DERRICK ENGINE

This photograph of a concrete factory, forcibly illustrates one of the striking advantages of reinforced concrete construction—its great window area, giving a maximum of interior light.

Reinforced concrete factory of T. S. Simms Limited, Fairville, N.B., constructed by the Aberthaw Construction Co., Boston, Mass.



Concrete Factories are Most Efficient

The efficiency of a machine is the ratio of the amount of work a machine does to the amount of work required to operate it. The output is equal to the input minus the work lost or wasted. The less wasted the greater the efficiency.

In the same way the efficiency of a factory may be defined as the ratio of output to input. Output financially, is increased by reducing unnecessary expenses.

Concrete Stops Wastes

Concrete buildings are proof against fire, water and vermin. They give the maximum light and are sanitary. They resist vibration, and are permanent and durable.

Fire-proofness reduces insurance rates. Water or liquids used in certain processes will not leak through floors to destroy valuable goods below. Rats and other vermin find no place to live in a concrete building, thus eliminating losses from this cause. Maximum light and sanitary conditions increase efficiency of employees. Lack of vibration reduces wear and tear on machines. Permanency and durability reduce depreciation.

The way in which concrete stops these leaks is fully described in our handsomely illustrated 224 page book, "Factories and Warehouses of Concrete." It contains photographs and data of factories and warehouses for all classes of industries.

You can have a copy free if you will mention this advertisement.

Canada Cement Company

Limited

Montreal

The SERVICE

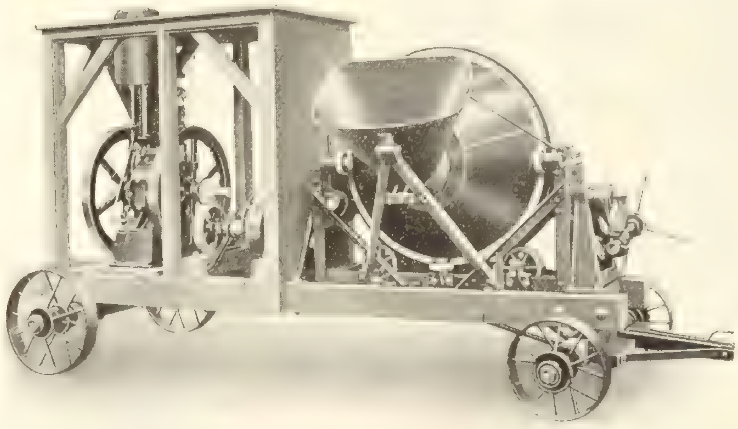
obtained from

Smith Mixers

Cannot be Equalled

They are built in Montreal under our own supervision.

Standard Smith Mixer on Trucks with Boiler and Engine.



Smith Mixer on Trucks with Gasoline Engine

Only the best of mate
erials enter into the
construction. Makin
them extremely ecc
nomical in repairs.

Write for Catalogue No 45

Montreal, 318 St. James St.
Toronto, 155 West Richmond St.
Cobalt, opp. Right of Way Mine.
Winnipeg, 259-261 Stanley St.

MUSSEN

THEY COST MORE

Smith Mixers on the Job.

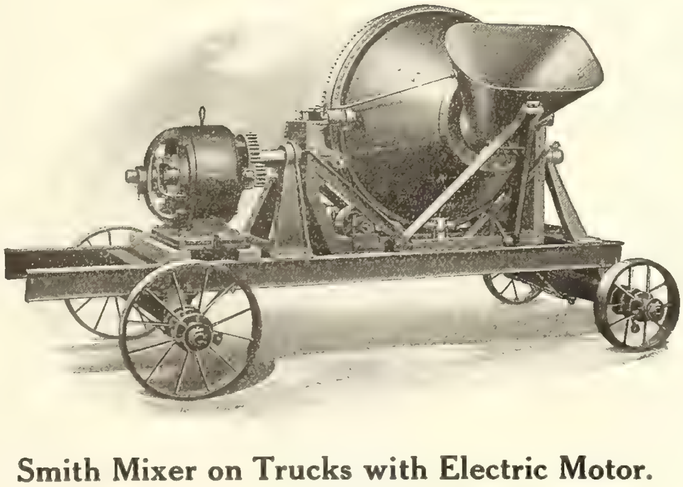
But they are worth it.

When you buy

Smith Concrete Mixers

ou are buying profits for yourself.

The Mixer that never fails.



Smith Mixer on Trucks with Electric Motor.

LIMITED

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(Continued on page 12)

Headquarters, Fire Department. Adelaide St. West, Toronto

Don Valley Bricks

THE above building erected under the supervision of Toronto's city architect is built of Don Valley Clay Products.

Don Valley Eaton Oriental Brick was used for the outer walls and the building is fireproofed throughout with Don Valley Porous Terra Cotta. The result is an imposing fireproof building that will look as fresh and clean cut in twenty years as it does to-day.

For pleasing and permanent effects in brick work

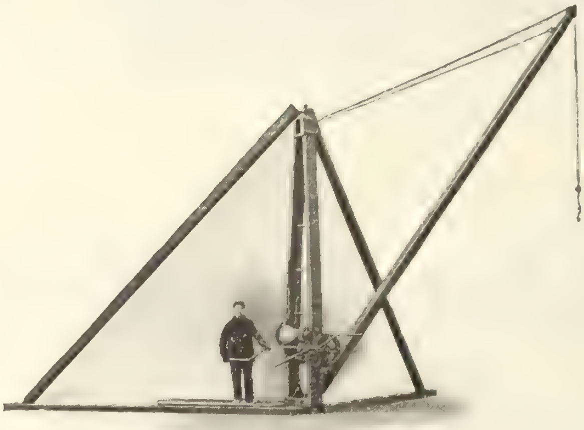
Specify "Don Valley Brick"

Don Valley Brick Works

Toronto, Ontario

Beath Scotch Derricks

Hand or Power



THE construction of Beath Scotch Derricks embodies several points of merit not found in other makes.

All stress parts are **steel** not cast iron. Bottom Pintle Bearing is of ball and socket type and works in a bath of oil, thus ensuring an easy movement at this joint.

Beath Derricks are provided with self-oiling bearings, ensuring easy operation and reducing wear to a minimum.

We also make Jinniwink Derricks, Stiff Leg Derricks, Guy Derricks, and Steel Derricks for heavy service. Hand or Power operated.

Send us your enquiries for Derricks

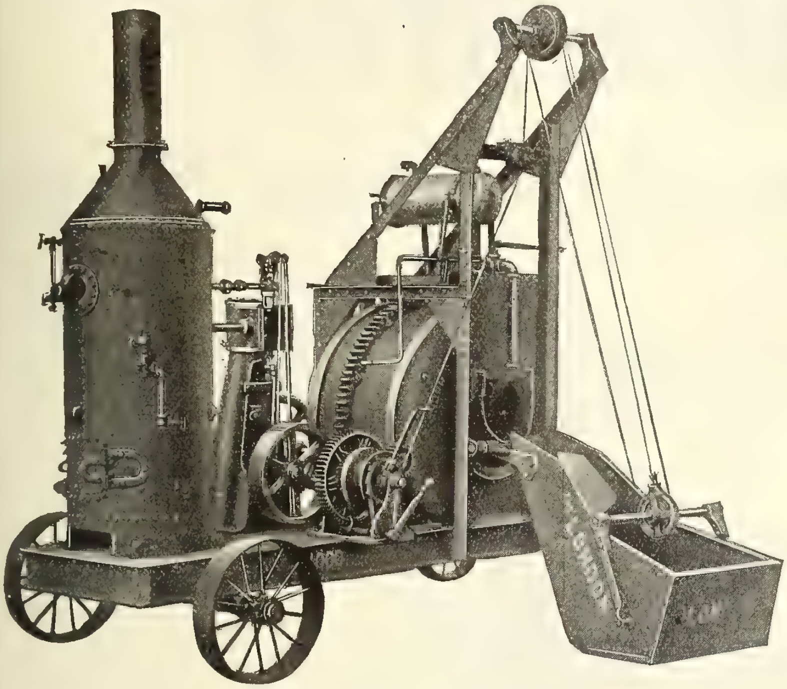
W. D. Beath & Son, Limited

ENGINEERS AND MANUFACTURERS

20-30 Cooper Ave., Toronto

The A. M. Ellicott Co., 301 St. James St., Montreal, Que., sole selling agents for Province of Que.

CONCRETE MIXERS



London Standard Drum Batch Mixer

Several Kinds, and built in sizes to suit all classes of work

The many improved features of the London Mixers have placed them in a class by themselves.

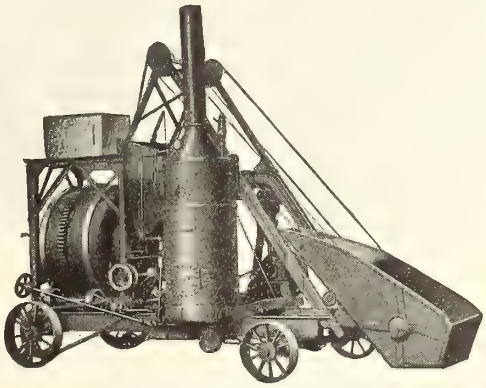
We can save the contractors money—

On First Cost
On Cost of Maintenance
On Cost of Operation

SEND FOR OUR CATALOGUE

We manufacture a full line of Concrete Machinery and Cement Working Tools.

Also a full line of Hoisting Engines and Contractors' Equipment.

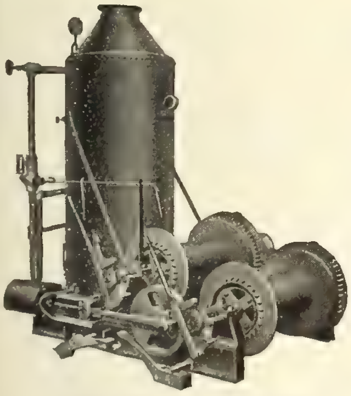


Rear Discharge Paving Machine with Forward Loader

Every machine made in our own factory.

Our machines are not made down to a price, but **made up to a standard.**

By manufacturing on a **large scale** we have been able to offer **high grade machines** at **remarkably low prices.**



Standard Hoisting Engine

We are the Largest Manufacturers of Concrete Machinery in Canada

No. 2 Automatic Batch Mixer

London Concrete Machinery Co., Limited

Head Office and Factory: Cabell St. and Kitchener Ave., London, Ont.

BRANCHES:
WINNIPEG (445 Main St.) W. H. Rosevear, Mgr. CALGARY (622 9th Ave. W.) P. D. McLaren, Mgr.
TORONTO (60 Richmond St. E.) F. D. Emsley, Mgr.

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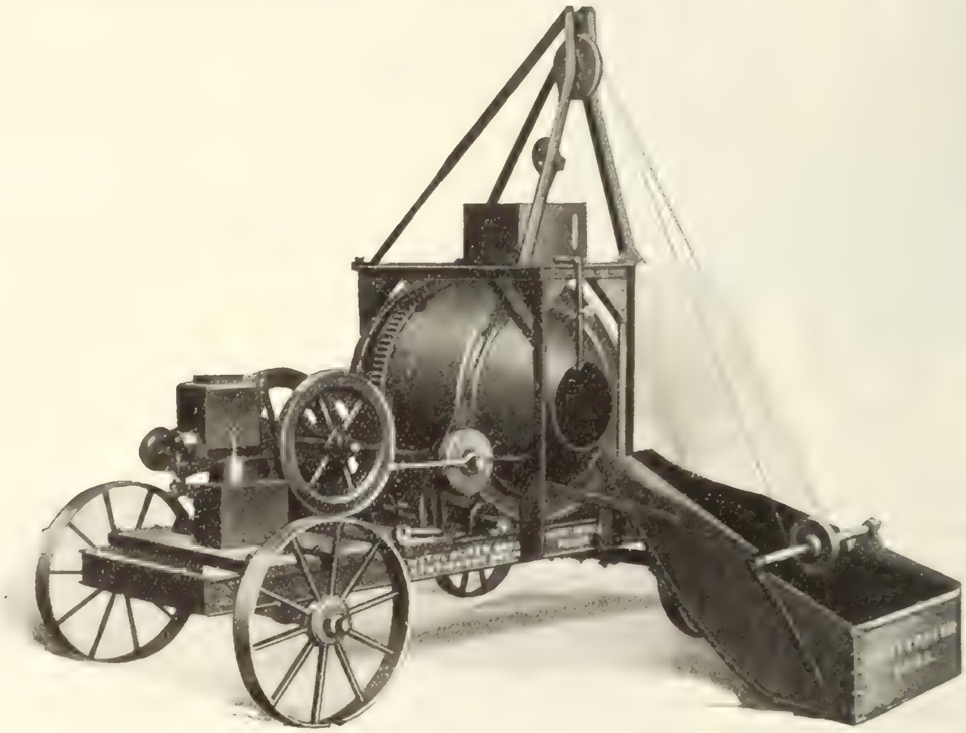
Wettlaufer

Stationary Heartshape Drum Mixer



To the extensive line of Wettlaufer mixers we have added a new type—the Stationary Drum Mixer.

Thoroughly mixed concrete is discharged from this mixer because of the heart shape drum and mixing fans, which insure the concrete being turned in every possible way.

The automatic loading hopper is easy to fill and empties quickly and cleanly.

This new mixer is strongly constructed of steel. The wheels are wide tired and heavy. The axles are heavy square steel.

Attend a daily demonstration at any of our branches.

Wettlaufer Bros.

178 Spadina Ave., Toronto, Ont.

Factories: Mitchell, Ont., Buffalo, N. Y., Detroit, Mich.

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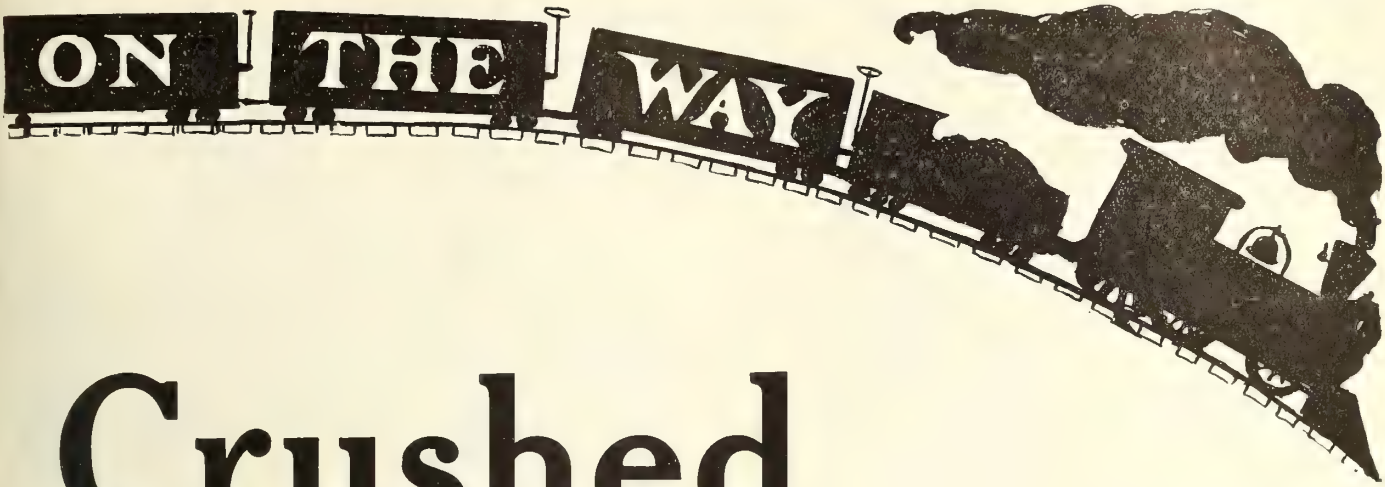

Crushed Stone

If you want crushed stone in a big hurry come to us and you will get it.

Our bins are always loaded to the top with stone of all grades and shipments can be made the day your order is received.

Quarries located at Dundas and Vinemount.

Portland Cement

Our several cement mills are located at various points that enable us to make prompt shipments with short hauls.

Send us your next order.

Alfred Rogers

Limited

28 King St. West, Toronto

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Metallic Roofing Company.
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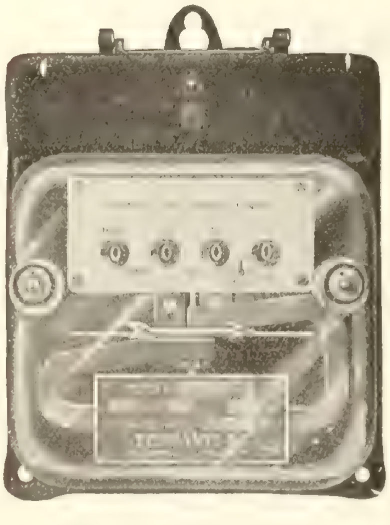
Ferranti Meters



Glass Case—Top Connections

Simplicity of construction.
Perfect accuracy.
Cyclometer or clock dials.
Top or bottom connections.
Prompt deliveries.
Every meter carefully inspected before shipment.
Absolutely guaranteed.

Send us your probable meter requirements and let us make you a proposition.

Large stock and fully equipped repair and erection Shops at Toronto and Winnipeg.

Steel Case—Top or Bottom Connections

The Ferranti Electrical Co., of Canada, Limited

TORONTO
90 Sherbourne St.

WINNIPEG
56 Albert St.

County Academy, Sydney, N. S. Built of Sydney Pressed Brick

Our plant is the only one of its kind in Canada making pressed brick from blast furnace slag. Brick made from this material is hard as flint—hardens with age and adheres with great strength to mortar.

Prices and Particulars on Request

Sydney Pressed Brick Co.
Limited
Sydney, Nova Scotia

Busy Contractors Use New Model Aurora Dump Wagons

because they want wagons that will haul the most material in the least time and that are on the job every working hour.

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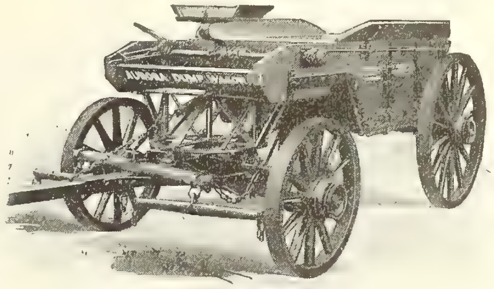

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	1904	3.30	1909	200.46
	1905	9.35	1910	14.07
	1906	37.33	1911	2.29
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Total $376.17 or 5⅔c. per sq. yd. for repairs for nine years, a little over 6-10 of 1c. per sq. yd. per year.

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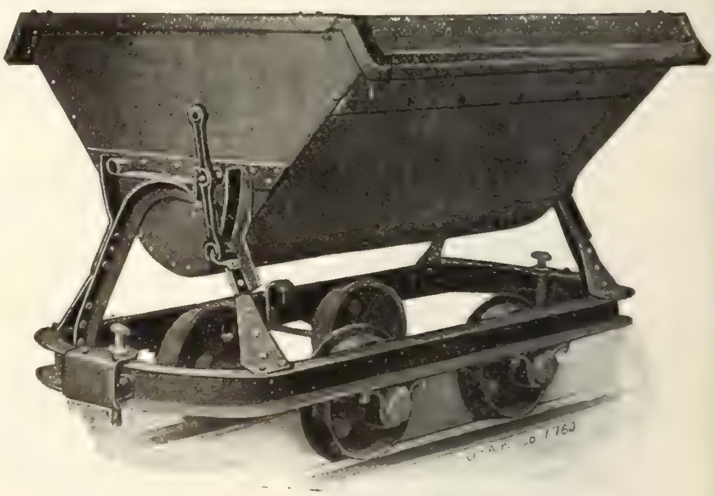

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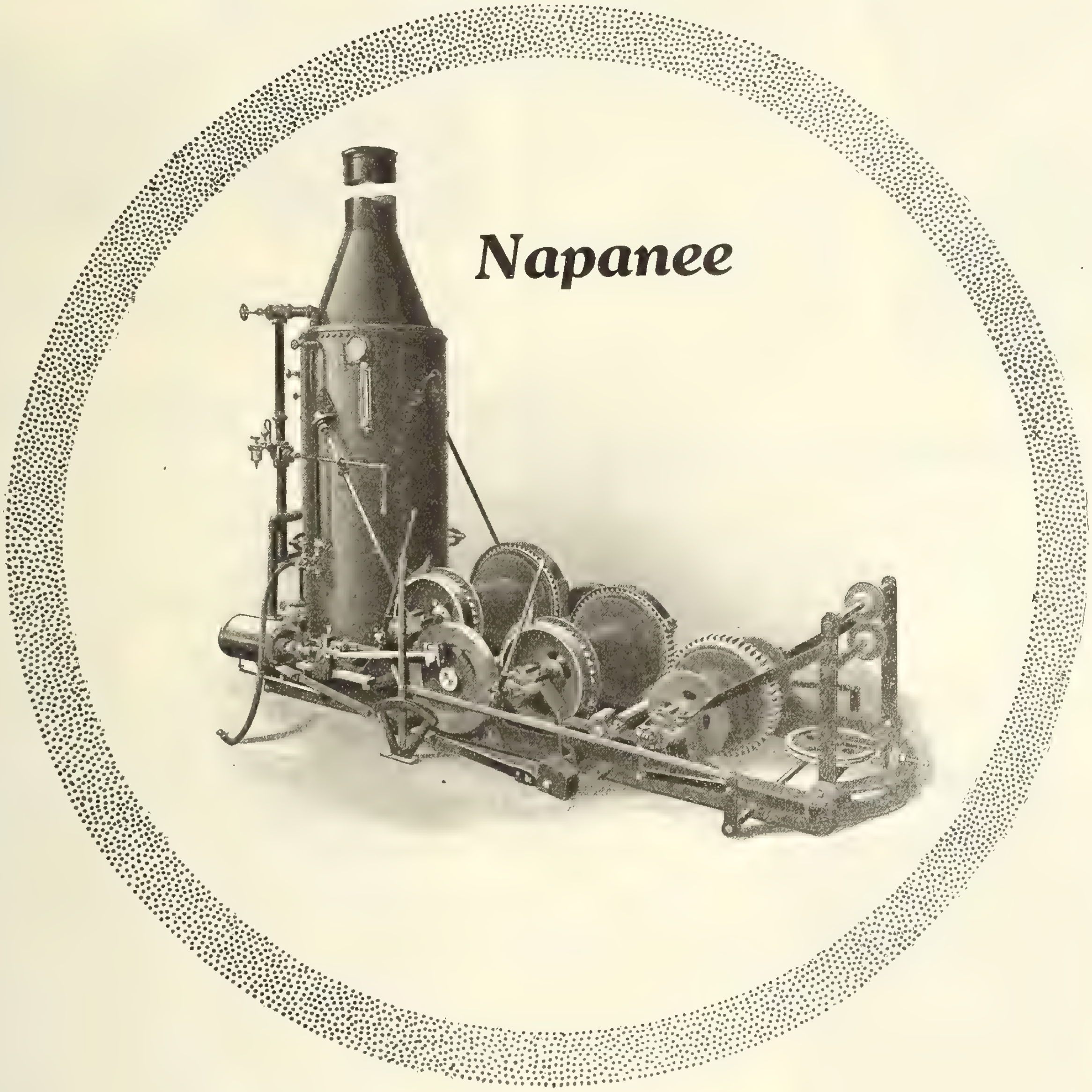

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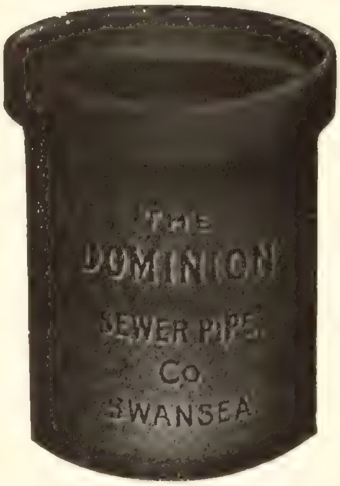

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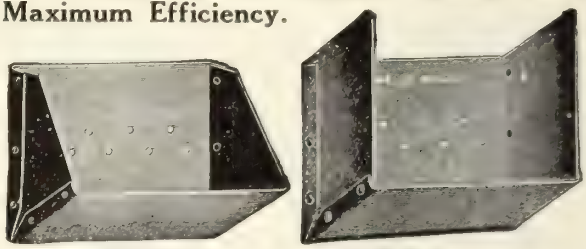

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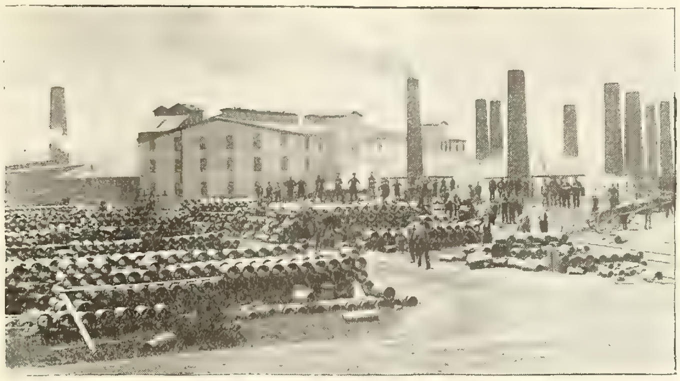

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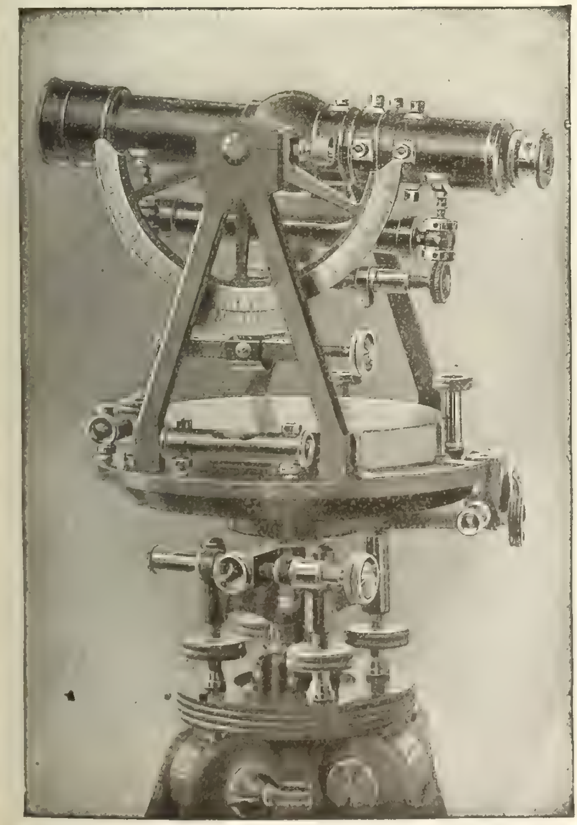

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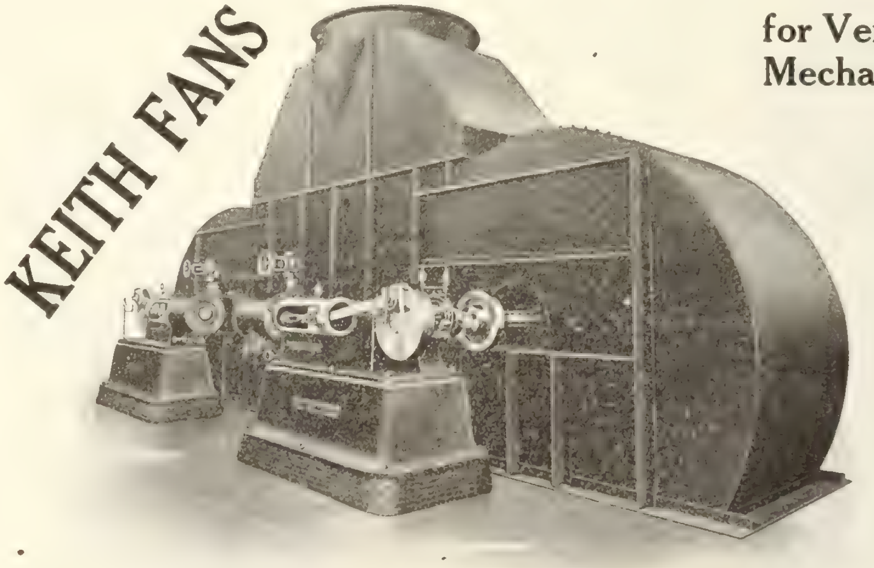

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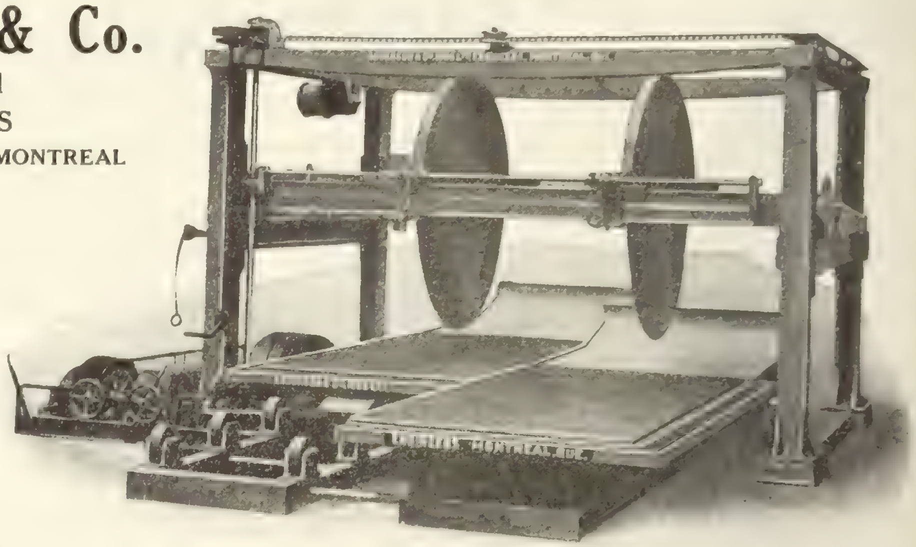

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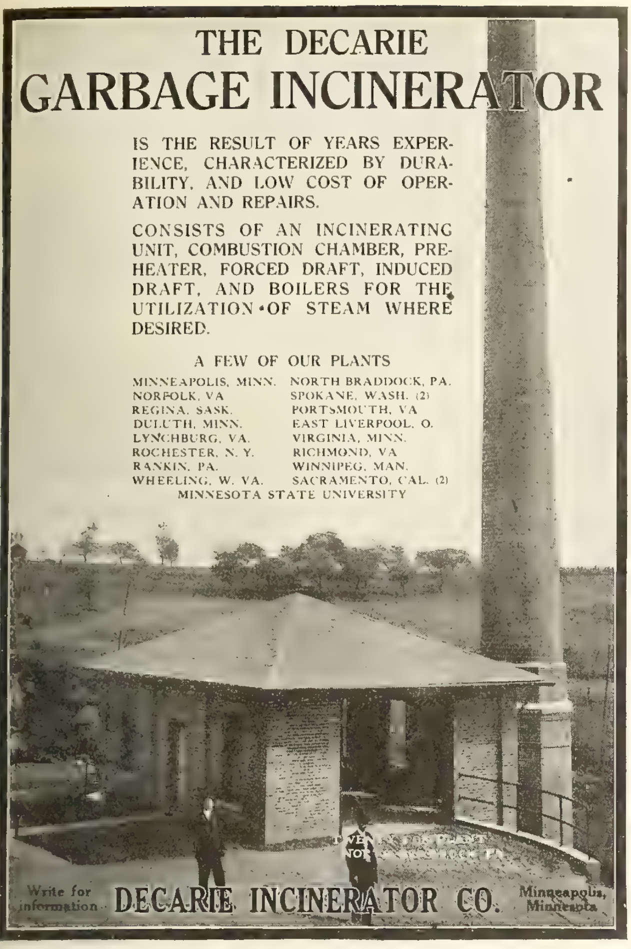

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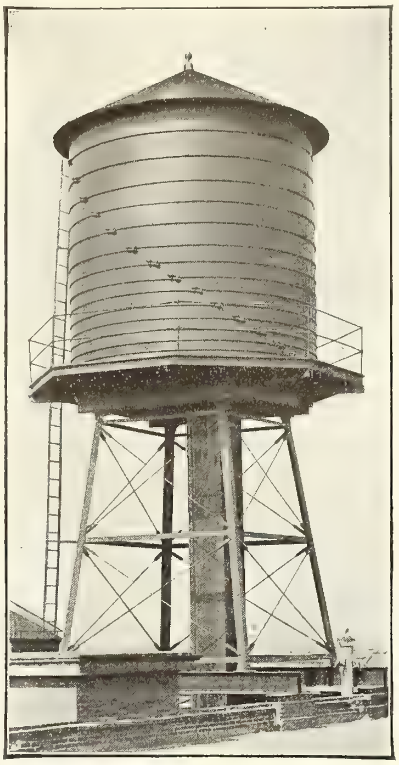

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is particularly adapted for the following everyday work in any carpenter shop or building under construction. Cutting Studs, Rafters, Braces, Boring for Dowelling, Tenoning, Dadoing, Pulley Stiles, Window Sills and Door Jambs, Routing, Stair Stringers, Mitreing of any kind, Tool Grinding, etc., and can be set to suit any of these purposes in one minute, and once set will do as much work in an hour as a carpenter will do in a day.

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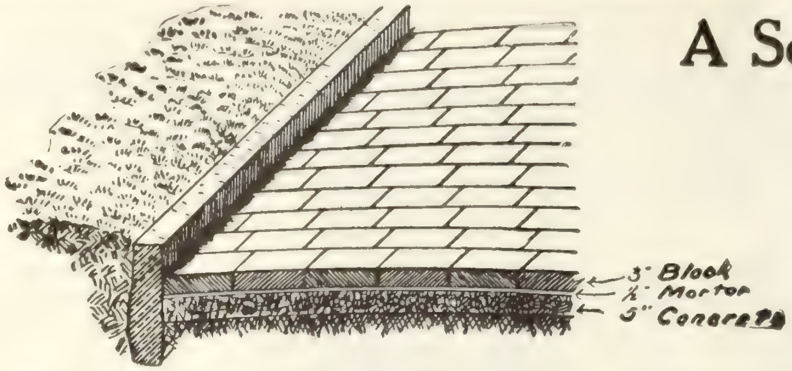

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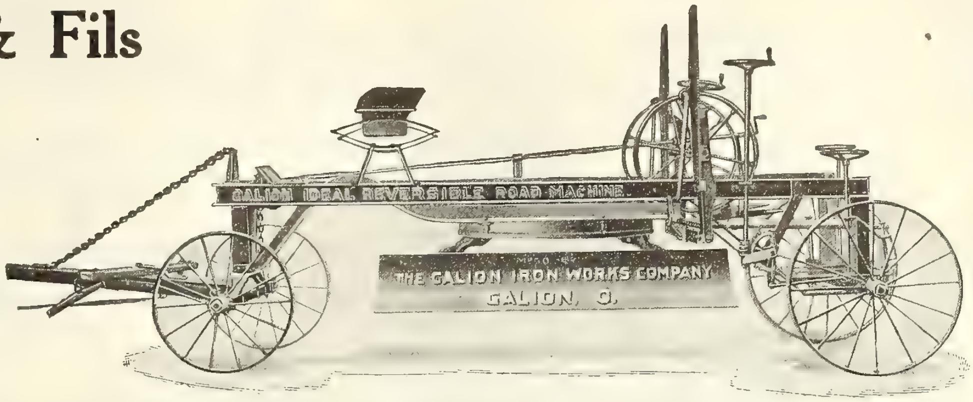
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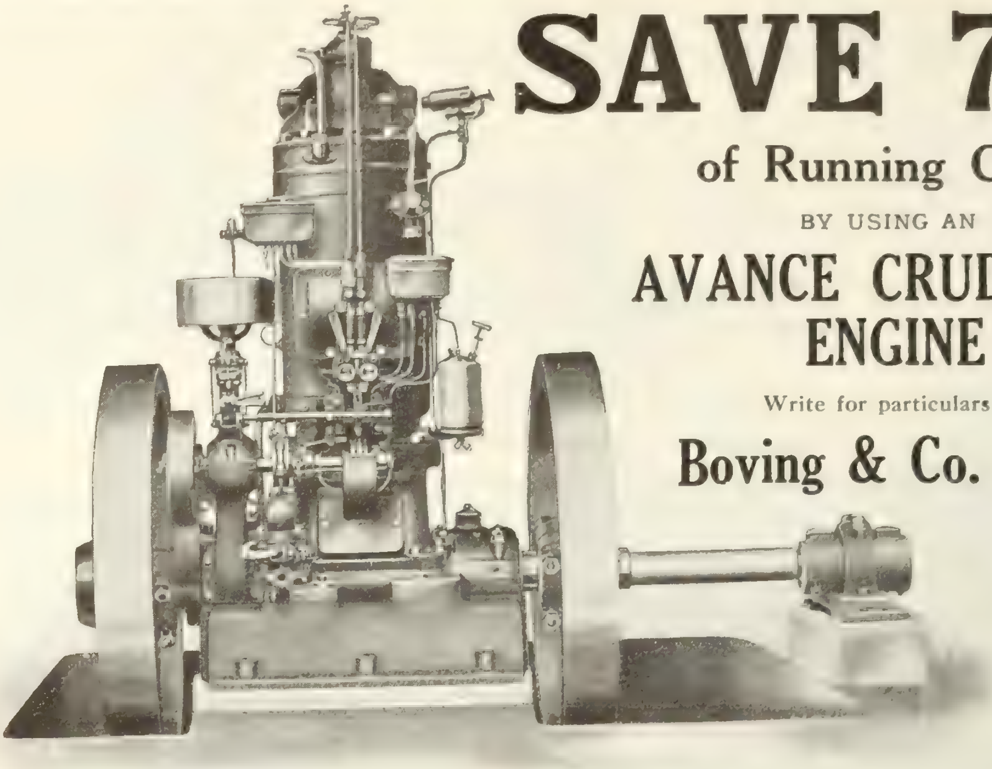

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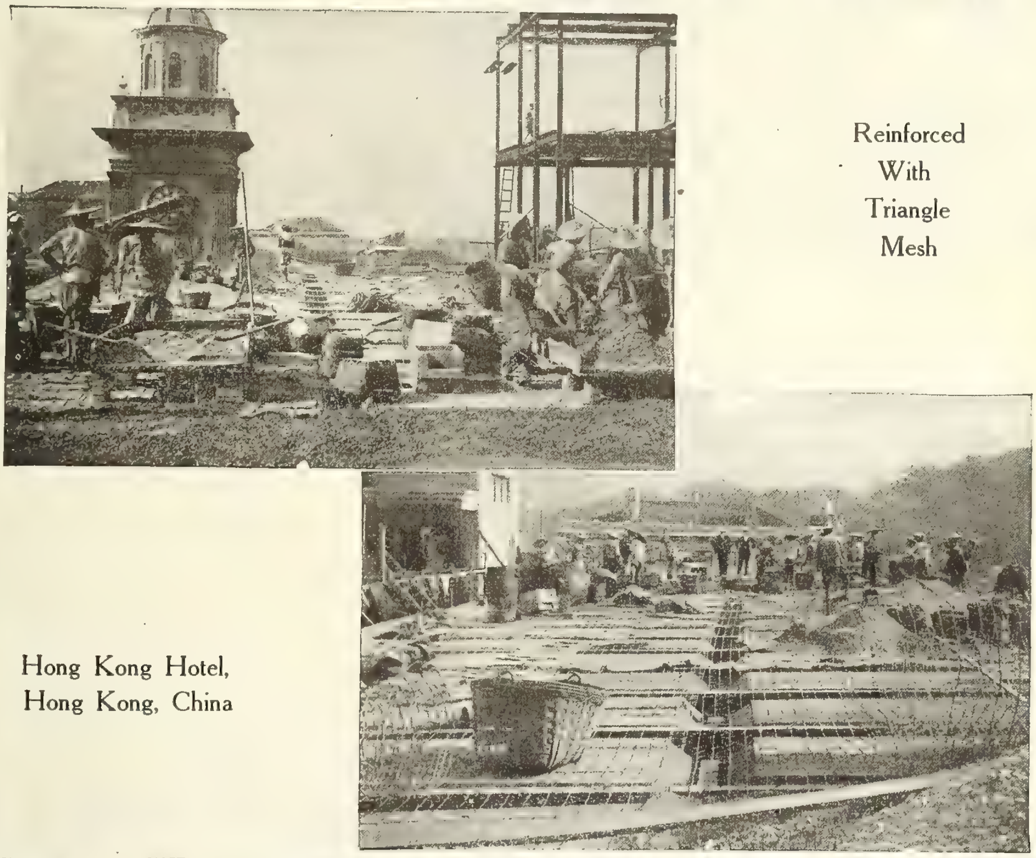

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They will quickly change the air in factories, workrooms, kitchens, billiard halls, etc., carrying away the smoke, fumes, hot air, keeping the atmosphere sweet and cool.

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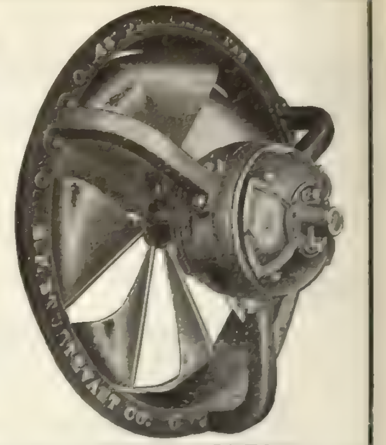

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Shall be pleased to quote you.

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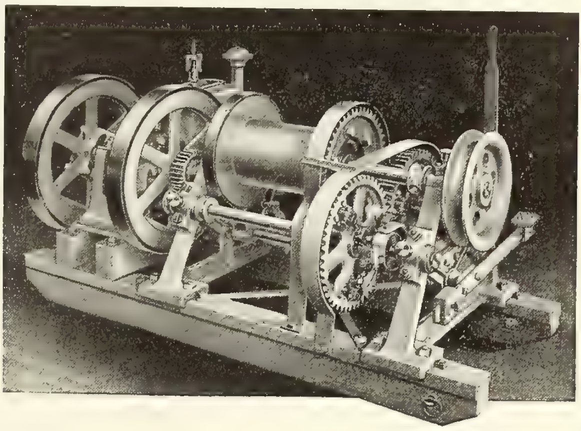
This Builder's Hoist is double acting in its action and was designed for use in operating a Double Cage Material Brick Elevator. The brake band and clutch shoes are lined with asbestos lining which can be readily replaced when worn. The gears of this Hoist are of heavy construction and of exceptional strength and the bearings and shafts are amply proportioned to the strains which they are to withstand. Our Material Elevators are very substantially built and all of this Material is carried in stock in Canada for immediate delivery.



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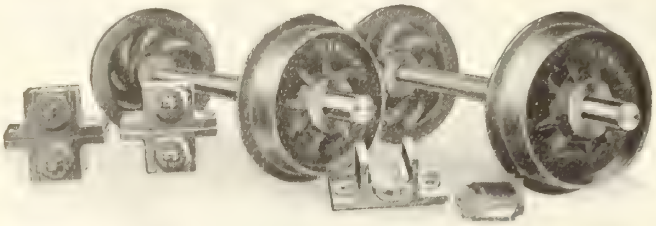

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Equipment is used on all the Largest Contracts

WHEEL SETTS

In all combination of sizes of Wheels, Axles and Gauges

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Can be fitted to practically any style of car. Let us figure on your requirements at once.

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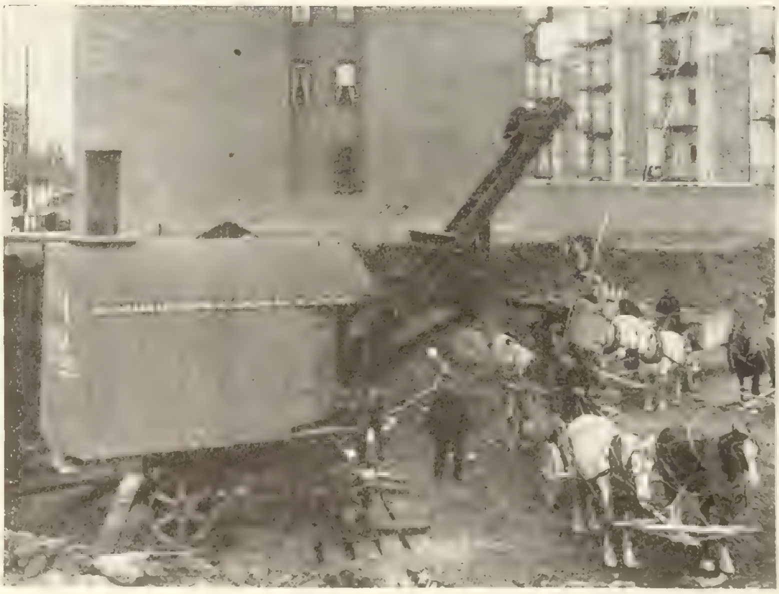
Write for prices. Alexandria - - Ontario *Send for photographs.*

Save Time, Trouble and Money

By Using a

THEW SHOVEL

for that EXCAVATING CONTRACT



The contractor with men and teams cannot compete successfully with the man who owns a THEW SHOVEL.

THE REASON WHY

The smallest Thew does the work of from twenty to forty men at one-third of the cost. The Thew, being able to load a wagon a minute, will often save enough in team time to pay its entire operating cost, which means that you are loading dirt for practically nothing. Hand labor is difficult to secure, hard to hold and inefficient in practice, while the Thew is always on the job.

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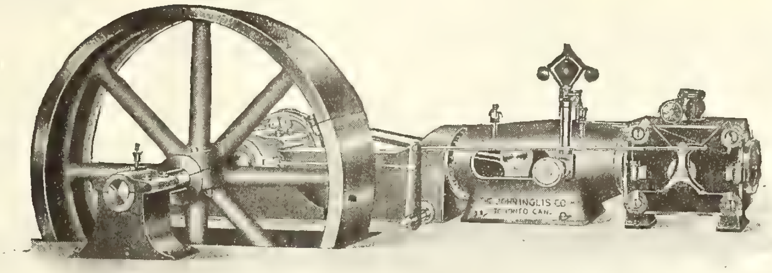

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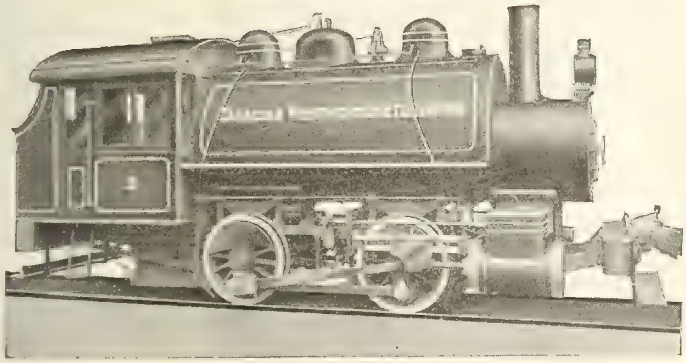

Locomotives on trunk line railroads have the advantage of the best facilities for inspection and repairs.

Contractor's locomotives face different conditions. They must work day after day in the hardest service, and often in localities where repairs cannot be made without great inconvenience.

When you want a locomotive you cannot afford to overlook the experience of this company.

Experience in building large locomotives is invaluable in connection with the design of smaller ones in order to insure reliability, which is the main question in contracting work. You know what delays cost you.

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Concrete Tampers

for all kinds of concrete work

Made with strong cast iron bases in following sizes:

6″ x 6″—8″ x 8″—10″ x 10″

and can be supplied with wood or gas pipe handles.

Our prices are lower than can be procured elsewhere and we can supply them in lots of one dozen or by the carload.

Made in correct shapes and are strong and durable.

Let us quote you prices.

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"Interlock Welded Necks and Atwood Line Welds"

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SIMPLIFIES MASON'S WORK AND SAVES HIS TIME

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For Greater Protection---For Longer Wear

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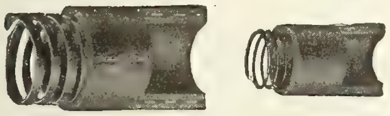
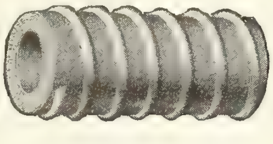
¶The walls of the hose are composed of long strips of cotton fabric thoroughly impregnated with rubber or friction. And cut on the bias to resist expansion, bursting and elongation. This friction-impregnated fabric is rolled under great pressure, which ensures a perfect union of the plies.



SUCTION HOSE

¶We build into Goodyear Hose the same strength and indestructibility as have made Goodyear Rubber Belts famous. Goodyear Suction Hose is steel-wound internally to guard against collapse. The coil is of round or flat wire, and round it the hose is built up, ply upon ply of rubber-permeated cotton fabric. This fabric is made from special hard-staple long-fibre cotton, and is cut on the bias to give strength and hard wear.

¶Goodyear Suction Hose is made for every purpose - and can be had rough or smooth bore. Is in service throughout Canada—on wrecking and dredging contracts—in factories and mines—on farms and in saw-mills. Special hose made for sand-sucking, oil, gasoline, vinegar and acid, wine, etc.



STEAM HOSE

¶Steam Hose gets more hard usage than any other hose. In the Boiler Room it lies around near the furnace and is scorched—a hot firing tool is carelessly thrown down upon it—oil is spilt over it.

¶Goodyear Steam and Hot Water Hose is made with special heat resisting lining, which keeps the extreme heat from the friction fabric. This gives the extra durability—it will stand up well under hard usage. In its manufacture the materials undergo special treatment to resist oil—so destructive to common hose. The rubber and duck used in Goodyear Steam Hose are specially tested for service under high pressure of steam and hot water. We supply it steel wire wound or marline jacketed.

GOODYEAR RUBBER HOSE

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¶With fair usage Goodyear Air Hose will be found proof against internal decay from oil—breaking away of pieces of the tube—and clogging of the machinery. The lining is made from selected rubber and cured to prevent hardening from the heat and pressure.

¶Goodyear Air Hose will give good service under intermittent pressure.

¶In mines, engine and boiler works, steel construction contracts—wherever pneumatic tools are being operated you will find Goodyear Air Hose. Wire or marline winding or marline jacket

THE GOODYEAR TIRE & RUBBER CO. OF CANA
THE GOODYEAR TIRE
THE GOODYEAR TIRE & RUBBER CO. OF CAN
THE GOODYEAR TIRE

GOODYEAR MILL HOSE

¶When Mill Hose is wanted it is wanted badly. To find that your Mill Hose has cracked and rotted while lying idle is serious. **"Goodyear Underwriters"** is always ready for effective service. We build this hose to meet the requirements of the Associated Factory Mutual Fire Insurance Companies. It bears the required stamp of approval "tested to 200 lbs. pressure." The inner tube is made from NEW Rubber of the highest grade, uniform in thickness and quality. The cotton fabric is of special circular web woven to the Underwriters' specifications for a minimum of expansion or elongation under pressure. It is antiseptically protected against rot and mildew.

¶For Factories and Mills the "Goodyear Underwriters" is a hose which will lower insurance rates, and cannot be excelled in durability and strength. You see it everywhere—the hose with the black and yellow stripes.

112

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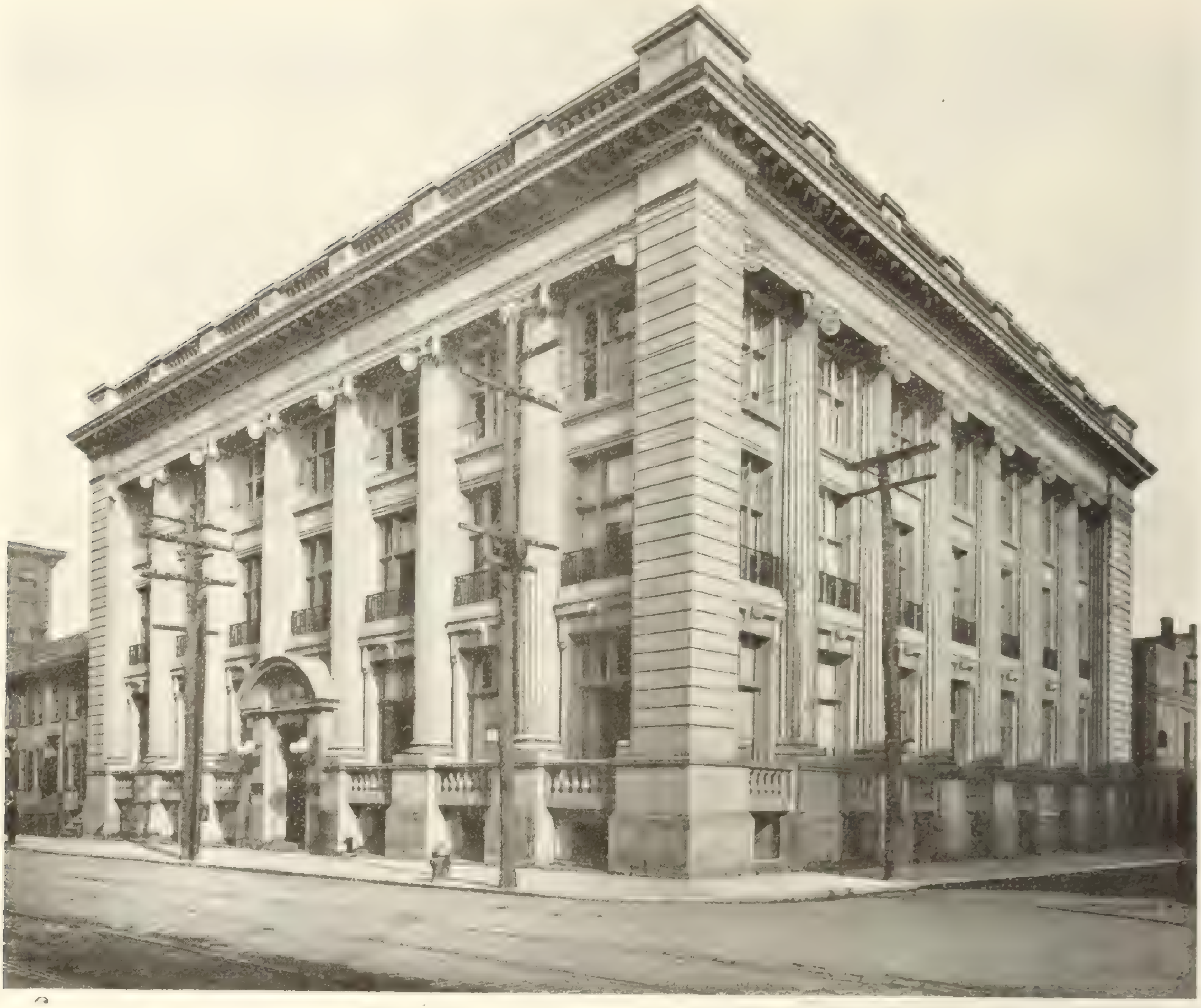

F S BAKER ARCHITECT
TRADERS BANK BUILDING
TORONTO

August 16th. 1912.

Dear Sirs:

In issuing your final certificate for the stone work of the Graphic Arts Building, permit me to say that I have been very much pleased with the manner in which you handled this important contract. The material is of an excellent quality, and deliveries were up to promises. The careful attention and courtesy of the officials of your Company has done much to facilitate the rapid completion of the building.

Yours truly,

F. S. Baker
Architect.

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The Roman Stone Company, Limited, Toronto, Ontario

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Containing the Announcements of Leading Firms and Individuals
Seeking Trade Extension in Canada

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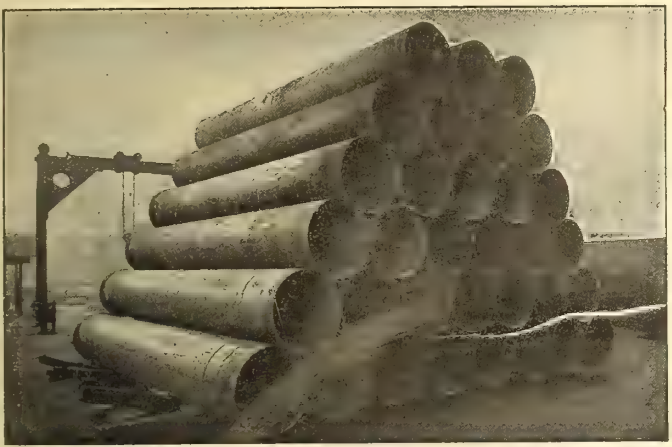
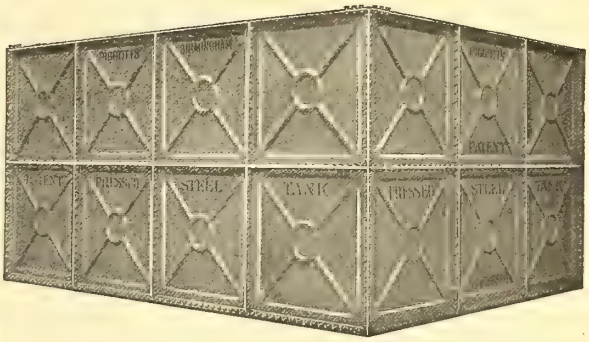
Steel Pipes and Tanks





Made in any length or width in multiples of 4-ft. by 8-ft. or 12 ft. deep.

STEEL PIPES
Welded or Rivetted

of any diameter over 12 inches.
With any type of joint
and for all purposes.

Gas, Water, Sewage, Steam, Etc.

PATENT PRESSED STEEL TANKS

are built up of plates 4 ft. square by 5/16th in. thick. There are only three types of plates and all are interchangeable.

Easily erected by unskilled labor.

Light, Strong, Cheap, Unbreakable.

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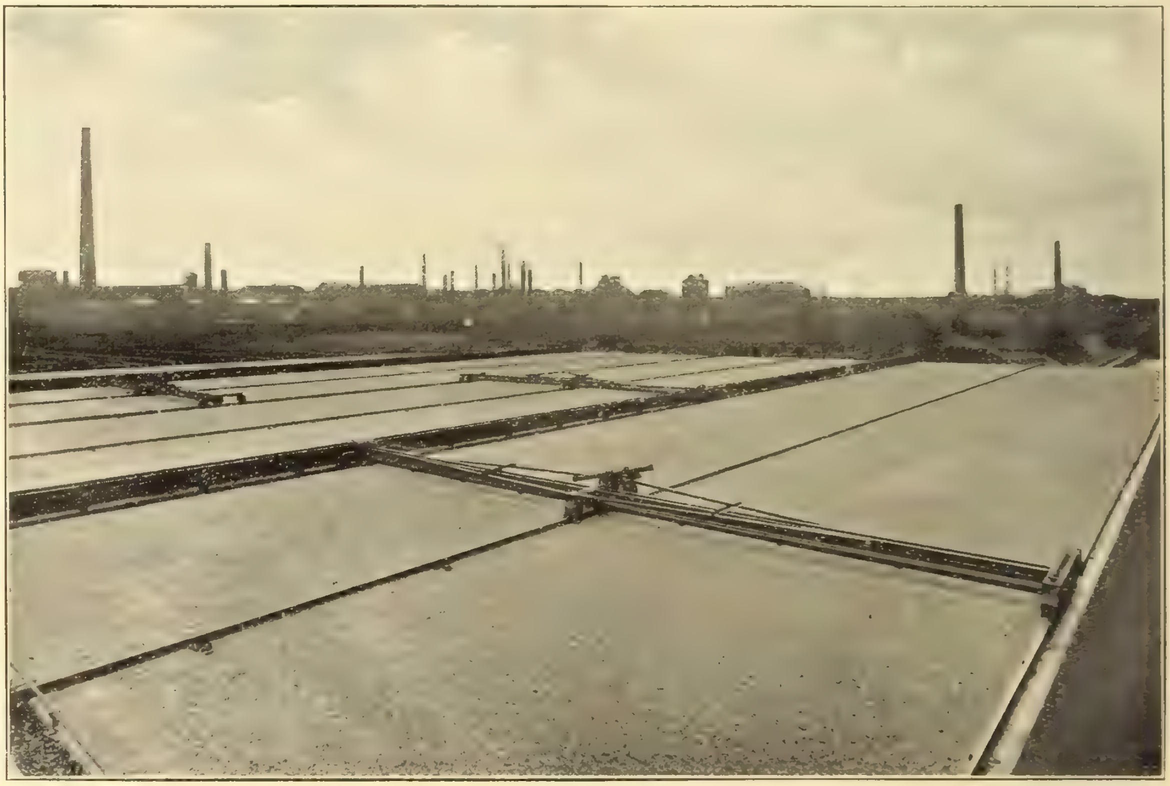

The illustration shows an equipment of Four Ham-Baker Patent Electrically Driven Sewage Distributors working on a bacterial filter bed 260 feet x 215 feet at the City of Glasgow (Scotland) Sewage Purification Works.

The total installation deals with a daily flow of 4,000,000 gallons.

These Distributors can be driven by steam, oil, gas or electricity. Low running cost.

Makers also of all types of Automatic Sewage Distributors and Sprinklers; also Spray Jets for rectangular and circular filter beds.

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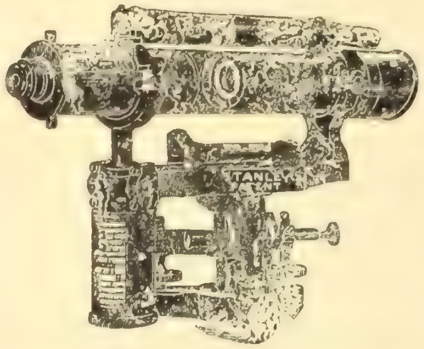

Stanley's Gradiometer Saves much time in Railway and Drainage work.

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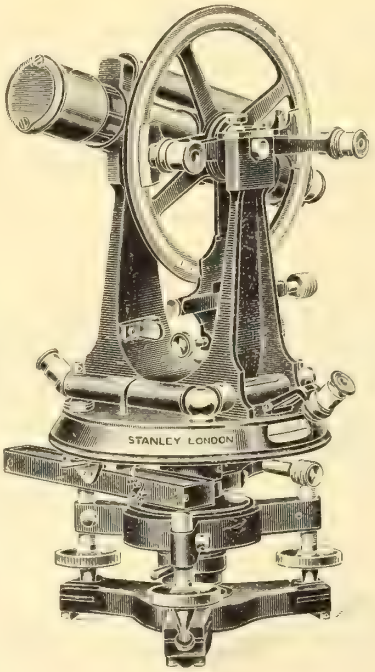

Please send for our "K91" Catalogue and compare our prices with those of other **first-class makers.**

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The "Pulsynetic" System takes least current, and depends for its accuracy upon the unvarying force of gravity.

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Excelsior Wire Rope Co., Limited

CARDIFF, South Wales, England

Manufacturers of

Steel and Iron Wire Ropes

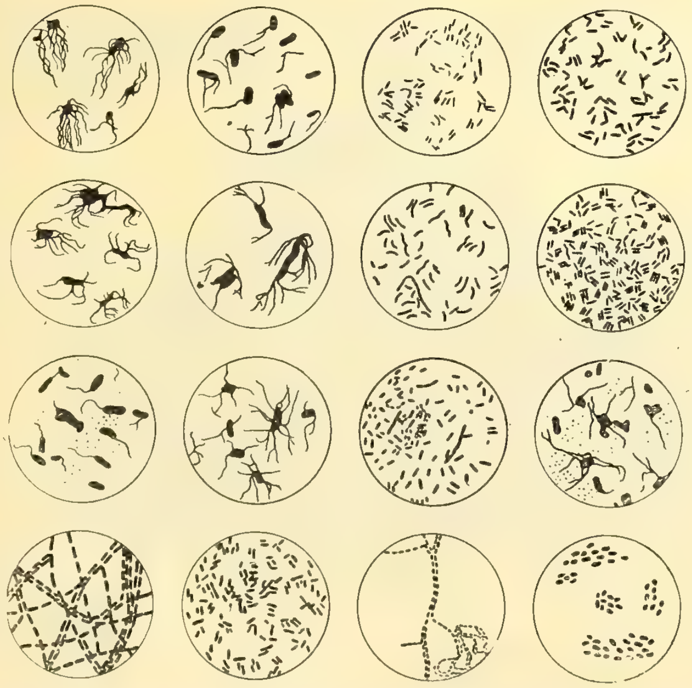
of every description and for all purposes :—

Mining, Ships' Hawsers, Running and Standing Rigging, Dredging, Lumbering, Oil Boring, Suspension Bridges, Aerial Rope Ways, Trawling, Cranes, Etc., Etc.

Our works are located in Cardiff, the largest exporting port in the world and the most convenient for Canada. Let us know your requirements.

Paterson Systems of Water Purification

The "Paterson Blue Book" conveys a concise general *resume* of the nature of impurities usually found in natural water supplies and the modern methods adopted for their removal.



Typical Water Bacteria: (reproduced from page 12 of the Paterson "Blue Book.")

Reference is particularly made to the Paterson System of Rapid Filtration, Sterilization, and Softening. A copy of the "Blue Book" will be sent post free on request.

Agents

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Board of Trade Blds.
Montreal

The Paterson Engineering Co., Ltd., 66 Amberley House, Norfolk St., London.

Barford & Perkins' PATENT WATER BALLAST **Motor Rollers**

Adopted by
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For road making and repairs of all kinds.
Petrol or Paraffin.
Start at once.
No carting of coal or water.
A large number in regular and successful use.

From 3 to 14 tons.

Lists in French on application.
Full particulars from the works at
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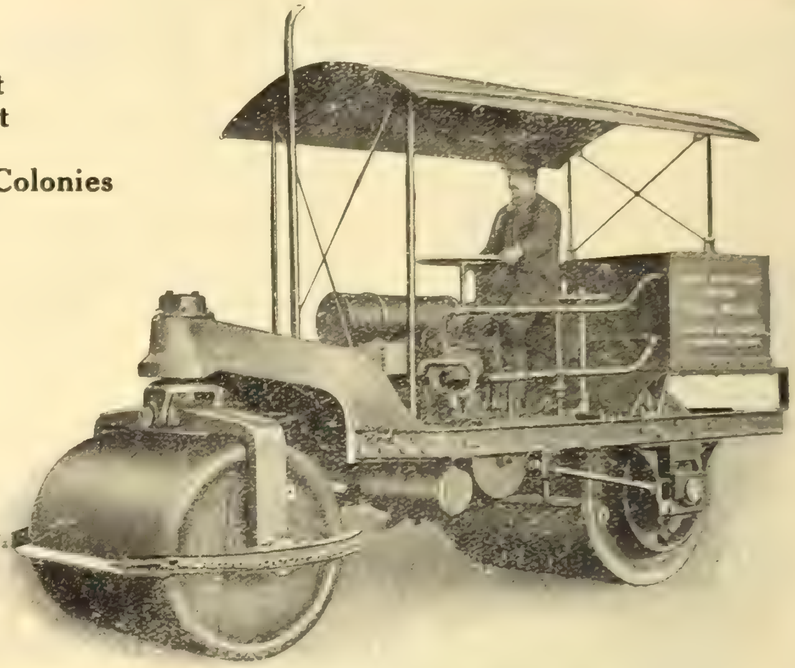

Three Motor Rollers have been supplied to the city of Winnipeg.

Sutcliffe, Speakman & Co., Ltd.

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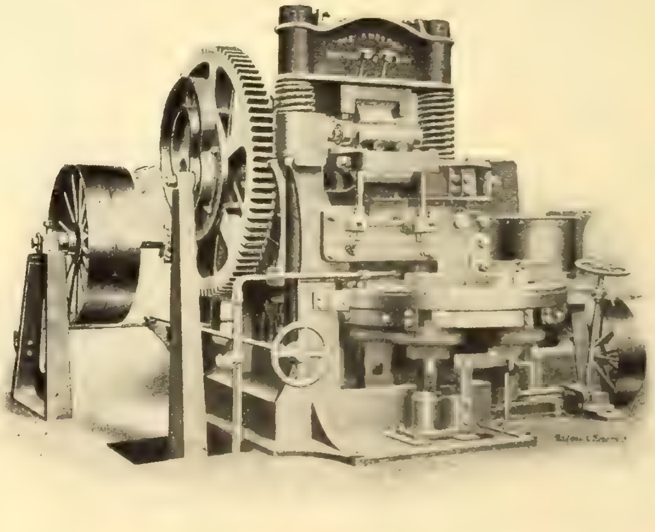

The Press That Makes The Bricks

Our Managing Director, who is an **"Encyclopædia on Bricks,"** is shortly visiting Canada, and will be pleased to meet interested parties. Address E. R. SUTCLIFFE (A.M.I.M.E. Whitworth Exhibitioner), care of "Contract Record," 220 King Street West, Toronto.

Cables: "UTILIZATION, LEIGH." Codes: A.B.C. (5th Edition) McNEILL (1899 Edition)

No Scheme is too Large — None too Small

PURE WATER

(*Buhring's Patent System*)

WE are experts in the science of Water Purification and Filtration. Our experience extends over a period of 110 years and our record is one of continued prosperity. We owe this to our keeping pace with the times and studying carefully every phase of the industry.

We Manufacture Apparatus of Every Description

and for every purpose—from the modest household appliance to the comprehensive plant for Town and Municipal use capable of purifying hundreds of thousands of gallons an hour. Our systems have been adopted by the leading Steamship and Railway Companies, Hospitals, Hotels, Factories, etc., throughout the world.

ONLY the best materials are employed by us in our manufactures. These materials, combined with expert workmanship, last a lifetime. Years of study, experiments and laboratory tests have enabled us to produce a ***filtering medium of supreme excellence***—a medium that collects and retains impurities, organic and inorganic matter, germs and harmful substances, and deodorizes and delivers water possessing all the necessary health-giving properties.

A SPECIALTY :—Our Patent Device for

AUTOMATICALLY CLEANING

and sterlizing the filtering medium :—The simplest and most effective.

Buhring's Patent Water Purifying Co.

60 Wilson Street, FINSBURY, LONDON, ENG.

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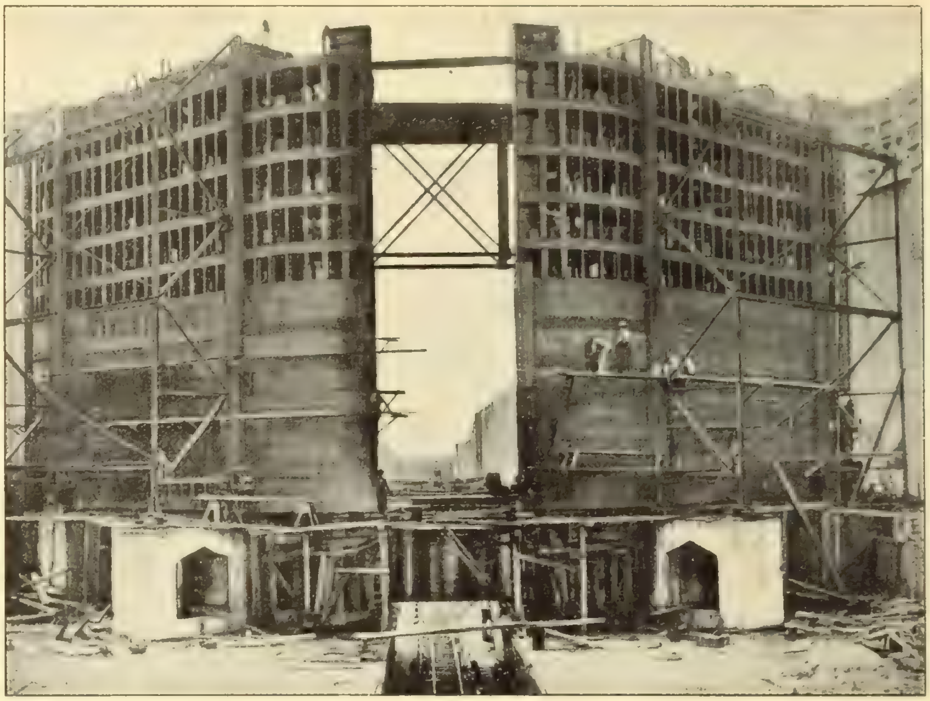
THE "WORLD'S RECORD" ANTI-CORROSIVE

Important Structures which are coated with "Bitumastic"



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46 pairs of Steel Lock Gates (area over 3 million square feet) coated with

"BITUMASTIC" ENAMEL

(APPLIED HOT)

Selected after endurance tests against over 300 competitors. The largest order ever placed for enamel work.

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7 1/2 Miles of 39″ Pipes
Coated with Patent "Bitumastic" Solution

The solution is a Brilliant Black Color supplied ready for use and applied same as ordinary paint.

DAMP and RUST PROOF
Unaffected by CHEMICAL FUMES
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720 Traders Bank Building, Toronto

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Province of Quebec—H. B. Hebron & Co., Montreal.
Province of Manitoba—Grose & Walker, Winnipeg.
British Columbia—N. Thompson & Co., Ltd. Vancouver, B. C.

Current Prices of Building Material

BRICKS

The following are wholesale prices delivered at Toronto:—

	Per M
No. 1 dry pressed red brick	$18 00
No. 1 dry pressed buff brick	18 00
Red Stock Bricks	13 00
Grey Stock Bricks	13 00
Wire cut bricks for foundation work ...	12 50
Porous terra cotta bricks	15 00
No. 1 enamelled bricks, all colors, from	$80 00 to $150 00
Sand-Lime Bricks	11 00

LUMBER (Building Material)

Hemlock Lumber—

2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$27 00	
2 x 4 to 2 x 12, 16 ft.	27 00	
2 x 4 to 2 x 12, 18 ft.	30 00	
1 in. Hemlock, No. 1	26 00	28 00
No. 1 Hemlock Decking	26 00	28 00
No. 2 Hemlock dimension and 1-in.	20 00	22 00

Pine—

1 in. common pine 8 to 12 in. wide rough	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
⅞ x 8 and 10 in. pine shelving..	36 00	42 00
⅞ x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine desking D2S	30 00	
Spruce Decking	28 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

Pine trim for paint finish—

4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8-in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

Shingles—

XXX B. C. Clear Shingles, per M.	3 90
N. B. Extras	3 75
N. B. Clears	3 10
No. 1 pine lath, per M.	5 00
No. 2 pine lath	4 50
No. 1 spruce lath	4 00

Cedar Posts—Fence—

5 in. at small end, each	30
7 in. at small end, each	35
Hemlock lath	3 50

Dimension Timber up to 32 feet:

8x8, 10x10, 10x12, 12x12, 12x14	32 00
8x10, 8x12, 10x14, 14x14	34 50
8x14, 12x16, 14x16, 16x16	34 50
10x16, 14x18, 16x18	35 50
8x16, 12x18, 18x18	36 00
10x18, 14x20, 16x20	36 50
8x18, 12x20, 18x20	37 00
10x20	37 50
8x20, 14x22, 16x22, 18x22, 20x22, 22x22	38 50
12x22	39 00
10x22	39 50
8x22, 14x24, 18x24, 20x24, 22x24, 24x24	40 50
12x24	41 00
10x24	41 50
8x24	43 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

	Star	D.D.
10 to 25 united inches	$4 25	$ 6 25
26 to 40 "	4 60	6 75
41 to 50 "	5 10	7 50
51 to 60 "	5 35	8 50
61 to 70 "	5 75	9 75
71 to 80 "	6 25	11 00
81 to 85 "	7 00	12 50
86 to 90 "		15 00
91 to 95 "		17 50
96 to 100 "		20 50
101 to 105 "		24 00
106 to 110 "		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for box lots:—

MONTREAL

	Star	D.D.
25	$3 25	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
90		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 u.i.	$3 50	$5 00
26/40	3 75	5 50
41/50	4 25	6 25
51/60	4 75	7 00
61/70		8 00
71/80		9 00
81/85		10 00
86/90		11 00
91/95		13 00
96/100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

STEAM FITTERS' AND PLUMBERS' SUPPLIES

Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock ...... net $1.85

No. 4½ Fuller's .... net $2.50

Square head brass cocks, 65 per cent.

Lead Pipe

Lead pipe, $7.50, less 5 per cent.; lead waste, $9.00, less 5 per cent.; caulking lead, 7 cents per lb.; traps and bends, 40 per cent.; pig lead, 5¾ cents per lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.28	¼ inch	$3.18
⅜ "	2.28	⅜ "	3.18
½ "	2.72	½ "	3.57
¾ "	3.28	¾ "	4.43
1 "	4.85	1 "	6.55
1¼ "	6.56	1¼ "	8.86
1½ "	7.84	1½ "	10.59
2 "	10.55	2 "	14.25
2½ "	16.67	2½ "	22.52
3 "	21.80	3 "	29.45

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

Soil Pipe and Fittings

Medium and extra heavy pipe and fittings, up to 6-inch, 60 and 5 per cent.

7 and 8-inch pipe, 45 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

CEMENT, STONE, STEEL, Etc.

Cement, barrel lots, in bags, delivered, Toronto, bags extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ⅜-inch, $1.45.

Burnt River rubble stone delivered, $17 to $18 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¾ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

Free stone delivered, $17 to $18 per toise.

Brown coursing stone, delivered, $3.75 per yard.

Grey coursing stone, delivered, $2.50 to $2.75 per yard.

Sand, for cement or brick work, $1.15 a cubic yard, f.o.b. Toronto, C. P. R. sidings.

Sand, for cement or brick work, 90c to $1.05 a cubic yard, f.o.b. Toronto, G. T. R. sidings.

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

Steel channels and beams, angles and plates, $2.65 to $3.00 per 100 pounds, delivered f.o.b. Toronto.

Hard Wall Plaster, unsanded, from $7.00 to $8.50, bags extra; sanded, $4.00 in car lots; hydrated lime, $10.00 in car lots.

Lime, per cwt., delivered, not less than 1,500 lbs. 33 cents; white, 43 cents.

Plaster of Paris, Anchor and Crown Brands, $1.50.

Manilla Rope, best, per pound, 12½ cents.

PAINT AND OILS

Pure White Lead, ground in oil, $9.00 per 100 lbs.

Boiled Linseed Oil in bbls., 6 c per gal of 9 lbs.

Raw Linseed Oil, in bbls., 6 c per gallon.

Turpentine, in barrels, 56c per gallon.

Pure Red Lead, dry $7.00 to $8.00 per 100 lbs.

Putty, pure linseed oil, in bulk, bbls., 3½c.

Putty, pure linseed oil, in 25-lb. tins, 4c.

G. WOOLLISCROFT & SON, LTD.
Cables, "Blizzard, London," A.B.C. Code, 5th Edition
HANLEY, Stoke-on-Trent England
Glazed and Floor Tiles of Every Description
Terra-Cotta, Quarries "Ironstone-Adamant"
Red Floor Tiles - Best and Cheapest on the Market

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Terra Cotta

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Works established over half a Century.
All Colors with plain or dragged surface or with Matt Glaze.
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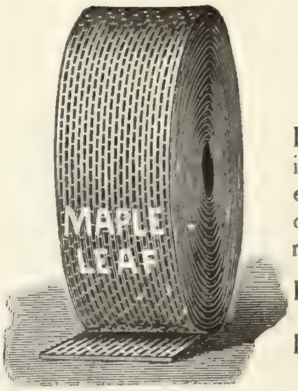
The reason is not hard to find, for there is no part of your Belting system, from the main drive to the smallest light Belt for power transmission, where you will not get the best kinds of service from



"Maple Leaf" Brand Stitched Cotton Duck Belting.

It is the most economical Belting because it is durable under every condition; even where other Belting will deteriorate rapidly. It is water proof.

It runs absolutely true on the Pulleys.
It is built of plies of selected duck.

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ROAD LOCOMOTIVE.

It has two road speeds. Traction platform and gearing on separate mountings. No strain on boiler. More power for weight than is found in any other Traction Engine.

BUFFALO PITTS CO. Road Locomotive at Road Work

Illustrations Show Outfits used in Building Roads in Northern Ontario

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This patented Reversible type of Road Car steers either way by simply throwing a lever.

No other car like it.

Makes the car efficient in places where others are useless. So strong the train will not pull in two. So simple a boy can operate. The greatest time saver of the age.

All Types of Buffalo Pitt Cars Can be Coupled in One Train

3½ yds. Patent Reversible Car Stone Spreading and Bottom **Dump Styles,** 5-ton size. Forged Steel Frame, steel wheels and special bronze bushings, special steel axles. 54-inch wheels with 8-inch tires. (Illustrated above.)

6½ to 8 yds.—10-Ton Wooden Frame Car. Same features of construction as described in 5-ton size.

6-Ton Patent Reversible Freight Car, Convertible, equipped with different bodies for brick, cement, asphaltum, oil in barrels, pipe, timbers or any kind of material. (As illustrated.)

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Haulage Outfits of Efficiency and Durability

BUFFALO, N.Y.

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Scherzer ROLLING Lift Bridges

"Used All Over The World"

Designed on the Universal Rolling Principle

200 Scherzer Rolling Lift Bridges now in successful use in the
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England
Ireland
Wales
France
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Belgium
Egypt
Russia
India
Burma
Hawaiian Islands
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South America
and other countries.

Some Reasons Why The Scherzer Rolling Lift Bridges Are Recommended by Engineers the World Over—

It is a riveted complete rigid structure.

Truss has no pin connections.

Very little machinery in structure—about 5 per cent. of total metal. (Machinery costs about three times as much per lb. as structural steel.)

Over 50 per cent. less MACHINERY than a design with trunnions.

So perfectly balanced as to require little power to operate.

Cost of maintenance low.

Raised and lowered without shock.

Less metal than other designs.

Gives maximum clearance of waterway without fender piles.

Machinery or truss not exposed to damage by boat lurching to side.

Concentrated loading at any point not as great as on a trunnion.

Counterweight is fixed. Height of counterweight not much over ordinary truss.

No high towers.

All parts easy of access.

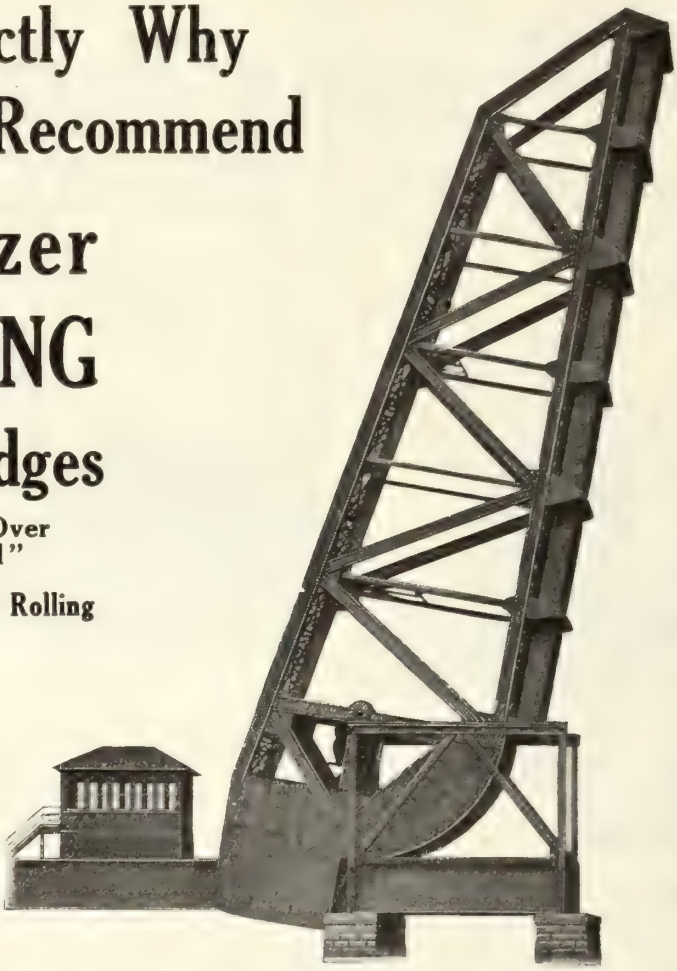
No costly trunnions or heavy castings liable to be displaced.

No uplift to overcome before bridge commences to rise.

Requires shorter piers than a trunnion.

Trusses roll in direct line of standard distance c. to c. of ordinary trusses.

Grade of railway or bridge could be raised in a simple manner.



Notice the simple, rigid, riveted one-piece movable bridge. Extraordinary simplicity and rigidity—greatest efficiency at less cost

Scherzer ROLLING Lift Bridges cost less to install, operate and maintain—because they are simple, rigid, riveted structures with less metal than any other movable bridge and far less machinery. They are balanced in all positions, minimizing motor power. Their base is rounded just enough to let them roll forward and down, closing them; or roll back and up, opening them. This forward and back motion saves large amounts in material, weight and motive power, as a much shorter span can be used. When open, the bridge is back, away from the channel, preventing accidents from moving boats.

No friction-causing axles, journals or trunnions are used to carry the bridge. There is nothing to lubricate but the small motor and very simple machinery. The curved base rolls on level tracks, using the simple principle of track and wheel used by all railroads. The foundations naturally cost less because the bridge weighs less. No wharfage is needed on either side. New bridges can be added beside the old ones, avoiding wasteful replacement.

A Scherzer ROLLING Lift Bridge can be opened or closed in thirty seconds, a vast saving in time for land and water traffic. Tracks are fastened permanently to the bridge, doing away with rail lifts or end lifts and preventing accidents. When open, these bridges are barriers against accidents and signal distant traffic to stop.

The Foundations Cost Less Because the Superstructure Is So Simple and Weighs Less

Send for sketches, estimates and full information, showing how Scherzer ROLLING Lift Bridges are adapted for the widest channels, with particulars of demonstrated efficiency and economy.

Scherzer
ROLLING Lift Bridge Co.
Main office Monadnock Block Chicago, U.S.A.

Eastern Office
220 Broadway NY

Cable Address
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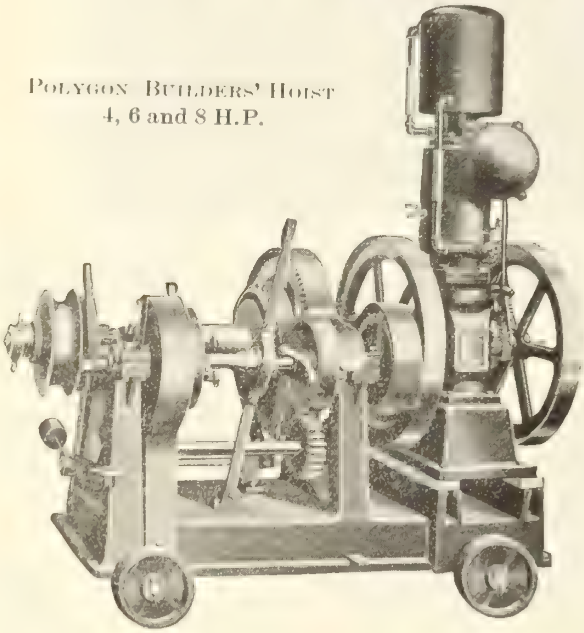
CONCRETE MIXERS
AND
BUILDERS' HOISTS



Polygon Builders' Hoist
4, 6 and 8 H.P.

represent the highest efficiency yet attained in their respective lines. They have demonstrated their superiority through ten years of steadily growing appreciation and large sales all over the world.

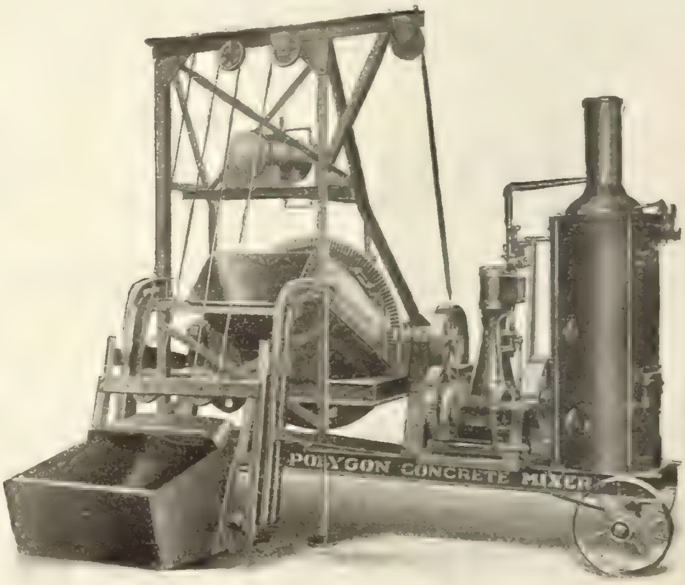
THE POLYGON BUILDERS' HOIST

is a distinctly great advance over all machines of the kind yet designed. Large lifting capacity in ratio to power employed; rigidity, long bearings, covered gears, easy control and other exclusive features warrant examination by all who wish the most efficient hoist to be obtained at moderate price.

The
Polygon Concrete Mixer

has the reputation of being "The Fastest Perfect Mixer." The POLYGON (many sided) form of drum is its distinguishing feature. Once you grasp the POLYGON principle of mixing you will have no other. It mixes concrete, mortar, and other materials, fine or coarse, wet or dry, with equal facility. Size for size the POLYGON will turn out a greater quantity of perfectly mixed concrete than any other mixer.

In all points that make for profit on the job, the POLYGON is the logical choice of all who really investigate. Ask us for full particulars.



Polygon Tilting Drum Steam Outfit with Side Loader
Built in capacities of 7½ to 50 cubic ft. of unmixed material per batch.

WATERLOO CEMENT MACH'Y CORP'N

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Mfrs. Concrete Mixers, Builders' Hoists, Elevators and Cement Tools

CANADIAN REPRESENTATIVES:—Waterloo Cement Mach'y Corp'n, Coristine Building, Montreal, Que.; General Mach'y Co., 22 Mulock Ave., Toronto, Ont.; J. W. Anderson, 3 Bank St. Chambers, Ottawa, Ont.; J. A. McTaggart & Co., Winnipeg, Man.; Strumbert, Virtue & Co., 319 Pender St., Vancouver, B.C.

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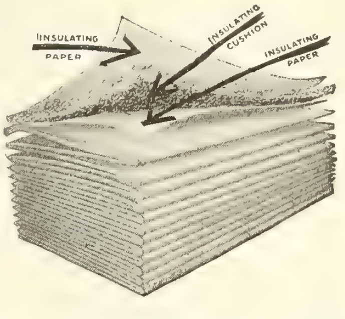
Why Keystone is The Best Insulator



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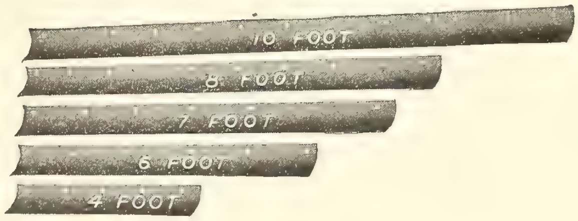

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Trade Extension Over-Seas*

GREAT though the improvement that has been effected during recent years in Canada's trade relations with the countries of the Old World, a careful examination of existing conditions reveals vast scope for further effort on both sides. The "Contract Record and Engineering Review" has had representatives in attendance at the International Road Congress (London) and other meetings this summer, and the opportunity has been taken to consider the trend of developments and the things that make for and against trade betterment.

In the first place it is gratifying to note an increasing disposition on the part of British manufacturers to discuss the possibility of doing business with Canada. This is worthy of mention at the outset, for the average Britisher of the class with which we are concerned is very conservative; he arrives at his decisions slowly and then sticks to his ground. Hence, by the way, his influence is a desirable factor in Canada, which is impelled occasionally by phenomenally rapid developments to hasty and ill-considered plans. The remarkable strides in every phase of human activity made by Canada in the last decade seem to have excited the interest and admiration of "the man in the street," and the suggestion of lethargy remarked on previous occasions is not in general evidence. True, business is not forthcoming by leaps and bounds, but in many cases this is attributable to the fact that trade conditions at home are so prosperous at the moment and the factories so occupied with orders for local markets that attention to new fields is practically impossible. We refer to a "suggestion of lethargy" advisedly, not unmindful of the two billion dollars odd that has been invested to date in the Canadian field by British interests.

It would appear to be yet another exemplification of the adage, "Nothing succeeds like success." Canada, as a constructional phenomenon, compels attention. England's greatest men visit Canada and return to testify in enthusiastic terms as to the unprecedented development of towns, cities and railroads and the characteristic enterprise of the people. Rudyard Kipling, who, after a few years' absence from Canada, returned to find the dreams of less than a decade translated into realities of brick and stone is generous in his praise of Canada in such good company as Earl Grey and His Royal Highness the Duke of Connaught. Of itself the testimony of such men would avail little were it unsupported by the opinion of the rank and file in the business world. Lustre was added to the name of Canada upon the return of the party of British manufacturers who visited the principal towns and cities of the Dominion recently. The enthusiasm of prominent men coming back to England with the impress of Canada upon them is catching. And so we find the Britisher in a more receptive mood. So much the better for our mutual interests.

Of the constructive factors, none is more potent than the interchange of visits by responsible persons whose opinions and statements are entitled to rank as first-hand, reliable information. Only well-balanced reports are worth having. The pros and cons must be taken together. Alluring pictures of distant fields often mean a set-back ultimately.

A careful reconnaissance of the field by one of the principals of a firm is essential, for the reason that the varying practice of the constructional world necessitates special adaptation in the consideration of new territory. The appointment of reliable, enterprising agents is half the battle, and it is only after a close observance of local conditions that one is able to make such appointments wisely. Not infrequently one finds British manufacturing concerns placing their agencies indiscriminately with men who are either incompetent or who have too many irons in the fire to do justice to the introduction of new lines, which require the concentration of a man expert in adaptation, from the technical standpoint, and enterprising, yet judicious, in publicity. The Englishman who knows his Canada well, not from book-lore but from personal intercourse, will also appreciate the desirability of sending out experienced men, who, by a broad knowledge of the world, have lost the insular prejudices so often found in younger men who have received promotion to Canadian agencies by virtue of their technical qualifications and a period of meritorious service at the works. Adaptability, in Canada, is a sine qua non; enterprise is another. Technical ability of itself is a poor recommendation for a resident agent. Where representatives are appointed direct from Great Britain an irrefutable argument in favor of sending the best men is that we Canadians are apt to estimate the character of the home industry by that of the man with whom we have to deal on our own ground. We make no apology for thus emphasizing this point.

Before passing on to another phase of our subject we will express the opinion that in all cases a liberal appropriation is necessary at the outset. Many competent men have been handicapped most unfortunately by an insufficient salary and expense allowance. Canada is a large field—nearly as large as Europe, and generous terms must be allowed those who undertake to exploit it. It is an economic absurdity to place a man in the field and restrict his operations by limited means.

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* Direct from one of the Editors of this journal now in London.

Without exception, the complaints heard in England and elsewhere concerning Canadian practice, or rather malpractice, have been the subject of many an editorial discourse in the "Contract Record," and to recount them again would be wearisome. Suffice it to say that they are identified mainly with the shortsightedness and incompetence of our governing bodies. A great contractor in old London, whose achievements, engineering and otherwise, have made him world-famous, told us in the course of an interesting discussion of trade relations that the good men in Canada were all too busy with the advancement of their own interests to participate in administrative affairs, and that Government work suffered in consequence and fell into disrepute with outsiders. Loyalty to home institutions is strong with us, but we blush to recall certain occasions where undue preference has been shown Canadian firms in what has been advertised as open competition. If we are to develop on broad lines, in keeping with the extent and opportunities of our country, we must see to it that the competitions for our constructional undertakings are universally associated with the idea of a fair field for all. In business there is little place for sentiment. Value for value is the fundamental business principle. There can be no "Open sesame" committed to a privileged few. The only advantage that Canadian firms should have over British, or British over United States, is where all other things are equal.

As to insufficient time allowance and inadequate publicity, we have already placed ourselves on record a number of times, but we will go so far as to say that the hasty expenditure of public monies is criminal. We are entitled to demand that the works planned by Government authorities should be pre-arranged to such an extent that all competent contractors of good financial standing are able to figure on them. With all that has been said about Canada's great development, ignorance is still to be found in the most unexpected quarters. This can only be overcome by effective publicity, the most potent force in the world to-day.

There remains but little to add except in emphasis of the general prosperity of Canada. British manufacturers are apt to be unduly influenced by reports of the "tightness of money" and the depression of stocks. Sometimes they overlook the fact that Canada is uniformly prosperous, that every trade in the country is taxed to the utmost resources of its activity and that temporary depressions are a blessing in disguise for Canada in that they serve as a check upon real estate speculation and divert money into the channels of legitimate enterprise. Money is not wanting for sound investments. Undertakings of a substantial character, promoted by men of repute, seek no backers.

Trade returns show the same ratio of increase. Just as the year 1912 was better than 1911 so 1913 is consistently better than 1912. In support of our contention we are prepared to furnish authoritative returns from city clerks and city engineers. We have them at hand, but the short space allotted to this article, as well as a consideration for the reader, who generally dislikes statistics, prevents our introducing them. We assert confidently that there is no ground for a pessimistic outlook.

Canada offers an unparalleled opportunity to the British manufacturer—particularly in regard to the introduction of such equipment as the progressive interests identified with this journal are in need of, e.g., labor-saving machinery of all kinds.

We rejoice in the prosperous conditions now obtaining in the Old Land, but history repeats itself, and when a falling-off in home trade is experienced, the man who has fortified his business by establishing a good connection with Canada—which has not infrequently remained the one bright spot in a world of depression—will pay tribute to the inscrutable workings of a Providence which guided him in the direction of the New Canaan.

Canada as a British Market

CANADA'S trade for the year ending with April, 1913, passed the billion mark, the total being $1,079,934,018, an increase of 22 per cent. over the previous year. This does not include that great mass of purely local and inter-provincial trade for which there are no statistics, but refers only to the volume of interchange carried on with those outside of our own borders. Canada has become an important market for a great variety of manufactured products. Nor has this market reached its limit. For years to come this part of the British dominions must remain largely an agricultural community. Each year adds hundreds of thousands to the population and with an expanding population comes an increased demand for manufactured goods, so that as a market for this class of products Canada presents remarkable opportunities.

During the fiscal year which ended March, 1913, the trade of the Dominion with the United Kingdom of Great Britain and Ireland amounted to $269,045,844. The total of the exports to Great Britain was $151,853,413, while the imports from that source amounted to $117,192,431.

In 1893 the trade with the Motherland (import and export) totalled $107,392,176. Each year since that date, excepting 1895 and 1896, has seen a marked increase. 1911 shows an increase of 14 per cent. over 1910 and 1912 an increase of 6 per cent. over 1911.

The imports of the Dominion of Canada from all countries during the year which terminated March, 1913, reached the sum of $678,587,617. Of this amount, as previously stated, $117,192,431, or 17 per cent. of the total came from Great Britain. France furnished $11,885,706, Germany $11,146,746 and United States $368,145,107. It will be observed that France and Germany furnished each less than 2 per cent. of the imports while the Republic to the south supplied over 54 per cent.

Some details concerning the value of the respective imports will doubtless prove informative and will serve to show the possibilities for trade expansion between this part of the Overseas Dominions and the United Kingdom.

The greatest import for the year was in metals and minerals and in manufactures of the same. The total volume of this class was $123,776,577. This includes brass $3,538,865; copper $5,193,165; iron and steel $96,181,586; tin, $5,420,188. To this large and growing class of imports Great Britain furnished $18,515,856, largely made up as follows: pig iron, $978,467, rolled iron or steel beams, $619,460, machinery, $2,180,168, iron or steel sheets galvanized, $1,389,343, bridges, $205,487, lead $533,464. A glance will reveal the fact that in this most important field, we obtained less than 15 per cent. from the Homeland. The lesson is obvious. Here is a splendid field for the English manufacturer.

The import of cotton fabrics for the year amounted to $30,982,915, of this the United Kingdom supplied $14,528,500, or very nearly 47 per cent. The point to be noted here is that while the cotton import has risen in five years from $23,427,248 to $30,982,915, the amount purchased from Britain has remained almost stationary and the percentage has fallen from 56 to 47. The very least that the British manufacturer should do is to hold the place already won in the expanding trade of this market. The value of woollen or partly woollen fabrics imported for the year reached the sum of $26,677,312. In this branch of trade with Canada, Britain stands without a rival and sent us 85 per cent. of the total import.

The question of the importation of machinery deserves more than passing notice. By machinery in this case we refer to such articles as printing presses, crushers, drills, compressors, cranes and articles of a similar nature. The total import for 1912 reached approximately $30,000,000, double the amount imported in 1908. These figures afford a striking commentary on the growth of Canada's manufactures. Of this total during the year just tabulated, Britain sent to Canada about 6 per cent. In 1908 she sent out to this country $1,280,858 worth of the machines mentioned or about 8 per cent. of the total import. The percentages are not very significant. The plain fact is this, that in five years Canada has doubled the import and added approximately $15,000,000 to its value, while the British manufacturer has added only a million to his export to Canada along this line. Here again is a splendid field for the British manufacturer and exporter if he cares to enter.

During the past five years Canada has experienced a most remarkable expansion in the building trade. So great has been the demand for builders' supplies, that with their plants working to the utmost capacity, the manufacturers have been unable to meet the requirements of this market. Extensive importations of this material have therefore been necessary. Bricks for building to the amount of $465,997 were imported. Great Britain furnished only $27,345 of this or less than 6 per cent. Sewer pipe and drain tile totalling $395,445 were bought away from home, and of this amount the British producers contributed $54,484 or about 12 per cent. While there are numerous cement industries in this country, the excessive demand required the importation of $890,612 of this important material. Of that amount $215,495 or 24 per cent. came from Britain. Bridge and structural steel prepared or partly prepared for the work of construction amounting to $651,244 was imported, Britain furnishing $205,487 or 31 per cent. The importation of glass for building purposes is an item of considerable importance, the largest quantity coming from Belgium. The total was $1,856,611, of which the British manufacturers contributed 20 per cent. The assurance of continued activity in the building trades in this country should warrant the producers of this class of material in the United Kingdom thoroughly investigating the possibilities of increased trade along these lines.

There are two classes of obstacles to be overcome in the development of the Canadian market for the British manufacturer. These may be termed geographical obstacles and local obstacles.

In discussing the former the distance separating these two parts of the Empire must be noted. The time required for communication, the long delay and great expense arising from any mistake in orders, the time and danger involved in transportation, all these are natural deterrents to British trade. However, improved cable service and still more rapid transit and cheaper ocean rates will, at least to some extent, lessen these hindrances.

The local obstacles are perhaps matters of temperament and long established custom. We have been trying to show that the Canadian market will amply repay any effort made to capture it, but this can be done only by determined, insistent and systematic endeavor. A thorough and detailed knowledge of the Canadian market, the manufacture of an article suitable to the needs and ideas of the buyer in Canada, and a widespread and constant publicity campaign are absolutely necessary on the part of the British exporter, in order that his goods may find as ready and extensive a market in Canada as every son of the Empire would wish.

Building Trades and Building Material

A MONTH ago a feeling of depression was perceptible in the building and construction trades of Canada. Reports for the first six months of 1913 from thirty cities throughout the Dominion, showed a falling off amounting to about seven per cent. in the building permits as compared with the same period of 1912. It was frequently stated that in the Northwest Provinces extensive projects were being abandoned, both by individuals and municipalities, because of the difficulty of financing the undertakings. In some quarters a drop in the price of building material was anticipated and owing to the greater abundance of labor some decline was expected here.

The month has passed and sentiment is more confident and hopeful. It cannot be denied that building operations have fallen off. Speculative building has been restricted and this has been accompanied by a more plentiful supply of building material and a greater abundance of labor, but it is also true, that there has been very little decline in prices and no serious depression such as was at one time anticipated. A comparison of the price list found on page 43 of this issue with the price list of any issue for the last six months will reveal very little difference in the prices. Some kinds of bricks and some brands of plaster may show a slight decline but on the other hand some material will show a slight advance. The prices are firm with every indication that there will be little change and the opening of spring will likely see a renewal of building activity.

A number of causes working together have prevented anything like a serious depression. The restoration of peace in Europe has renewed confidence and money is a little more easily obtained by Canadian banking institutions. The manufacturing concerns were stocked with orders for some time ahead. Just when most needed the various governments in Canada and the three great railway corporations announced the expenditure of immense sums in building and construction. The lesson of 1907 was not lost, and, as the president of one of the largest manufacturing concerns in Canada informed us, the larger firms had been providing a cash reserve for some time past which enabled them to tide over the stringency.

There is every evidence of a good crop and money to move it, so that the beginning of the next season will see a period of expansion along all lines, including building and construction, without the fever of excessive speculation.

Third International Road Congress

A Review of Some of the Canadian and United States Papers Presented at the Congress at London, England

(Staff Article)

We gave, in our issue of July 16, the text of the resolutions which were adopted by the Congress at its final meeting on June 27th. These resolutions were adopted after the consideration and discussion of the papers submitted, which numbered some 140 in all and represented the opinions of many nationalities. We had intended to present our readers with a precis of the whole of the papers, but careful perusal has convinced us that the space at our disposal could be better utilized in the presentation, in a much fuller form, of a selection from those papers contributed by Canadian and United States authors only. It must be noted that we have adopted the titles given to the papers by the authors, which vary in many cases from the official heading of the section in which a paper appears. The actual text of an author is printed below in smaller type than that in which the precised parts are set.

Planning of Systems of Streets and Roads

By Nelson P. Lewis, M. Am. Soc. C. E., Chief Engineer, Board of Estimate and Apportionment, New York City

In this paper, dealing for the most part with the direction of main roads as connections between populous centres, the author commences by showing that originally most of the main roads in America were merely trails which, whether long or short, were seldom actually constructed. The tractive force was great and the gradients necessarily light so that instead of cuttings and fillings, difficult topography was overcome by detours often necessitating a line twice the length of the direct line. With the comparatively short distances covered in the past and the ample time allowed, this was not a matter of vital importance, but to be constantly improving the construction of these circuitous roads without improving the alignment and extending new systems is a mistake. If to obtain good gradients, and at the same time pass through all small towns and villages en route, the cost is excessive, then, branch roads into such places are better. He points out that gradients, especially if short, are not as objectionable to motor vehicles as to those drawn by horses.

The principles which should govern the creation of a system of highways in a city are quite similar to those applying to a state or a country. The city will also have one or more principal traffic centres and a number of subordinate centres. Direct connections between these centres are of prime importance owing to the heavier loads and the lower speeds forced by greater volume of traffic. It is a mistake to treat a city and a contiguous rural system of highways independently of each other. The motor car has placed the city in such close relation with the rural districts surrounding it and with the neighboring towns, and their interdependence has become so great, that the entire system of highways, both rural and urban, must be considered as an entity. The chief highway connecting two towns should afford a direct connection between the important traffic thoroughfares of each. Frequently this is not the case, but the main and sometimes the only adequate road connecting them leads at either end into narrow, tortuous and shabby streets which must be traversed in order to reach the business and administrative centre. How different an impression one will obtain and how largely will the pleasure, comfort and convenience of a journey be increased if the approach to a town is through a dignified, well-paved thoroughfare constantly increasing in importance and interest until the climax is reached at a well designed and convenient civic centre.

It will frequently be necessary to create new and to widen existing thoroughfares. As the village grows into a city and the city into a metropolis, such improvements are sometimes imperative. Failure to provide them will prevent or retard the growth of the town, but their cost will often be so great that they will be undertaken with hesitancy.

The primary function of the street is to provide light, air, and access, and accommodation for such amount of traffic as it will be called upon to sustain. In cities many streets are required almost solely for the purpose of affording access to the dwellings fronting upon them. The traffic which they accommodate is often little more than that involved in affording ingress to and egress from the abutting dwellings for those who occupy them and the tradesmen who supply their daily needs. A large proportion of the streets are confined to this restricted use, others accommodate a considerable amount of neighborhood traffic, while through the great thoroughfares there surges the complex business of a metropolis and that which comes to it from the surrounding rural districts.

Land values in cities are so high that the provision of a greater width of street than is actually necessary involves a very serious burden upon the abutting owner both for the acquisition of the land and for surface improvements. To the degree that additional land is taken for streets, the price of the abutting land and its rental value will inevitably increase. It might seem reasonable, therefore, to limit the width of city streets to that which will accommodate vehicles and pedestrians when their movements are so regulated and controlled as to provide a maximum of capacity with such division into roadways and footwalks as to make suitable but not unnecessary provision for both. It is impossible, however, to foresee the changes which may take place in the volume of traffic as the city grows, and future widenings will be very costly. Where the height of buildings and the proportion of the lot which may be built upon are restricted by law, it may be possible to make a fairly accurate estimate of future needs provided these restrictions are maintained. In the United States such limitations of the use to which the abutting owner may put his property are almost unknown. The district which today is devoted exclusively to two-storey detached dwellings may, by the provision of good transit facilities, be rapidly converted into a section of compactly built tenements five or six storeys in height. They may not produce a great deal of traffic, but the decent requirements of light and air cannot be met if the street is from 30 to 50 feet in width, which might have been sufficient for the character of buildings originally erected. For these reasons there is a disposition in the City of New York to make 60 feet, about 18.3 metres, the minimum street width.

Outside the cities and towns the traffic is less local in character. In agricultural communities the proportion of traffic passing a given point which originates between the two nearest intersecting roads is very small. The benefit on the rural highway is, therefore, less local than is the case in towns, and the alignment, the rate of grade, the width and the character of the road surface are of general public interest and are to be determined by public need rather than by that of the abutting owner. The width of such roads should not be less than 50 feet, and should be increased to 60, 70 or 80 feet as the roads approach towns. Where radial highways are to be created leading from important cities into the neighboring country or to other towns, it is quite probable that the growth of the city will follow such arteries of travel, and it would be wise to give such roads a width of not less than 100 feet. In most cases the width of the metalled road need not exceed that required for two vehicles to pass, say 16 feet. More than this would be a waste of money until such time as increased traffic requires it.

Mr. Lewis evidently favors the by-pass system for new main roads passing old towns. In the case of main road crossings he advocates the acquisition of adjoining land and the rounding off of curves to obtain a fuller view. Curves in main roads should not, he considers, be of less radius than will give a view of 300 feet ahead. He advocates the provision of tracks for tramways along interurban highways, so separated from the roadway that vehicles cannot pass from the roadway to the track, which should never be permitted to cross the former at grade. In cities the centre of the roadway is the best position for tramways, but in no case should they be permitted in a street unless there is room for one row of vehicles between them and the pavement.

He thinks the provision of separate tracks for trams in cities will generally not be found feasible, as such space can only be acquired when traffic will be small and the returns not sufficiently large. Grass-covered tracks prevail at New Orleans but are untidy, but he cities the Bismarck Strasse, Charlottenburg, as a successful example of such an arrangement.

Discussing the relative merits of islands and refuges to direct traffic in busy streets, he is in favor of these where the traffic passes in equal volumes in different directions at the same time, but where it varies, say to the proportion of one-third and two-thirds at different times of the day, then a street is better without such means of direction. On the whole he considers the subdivision of roads advantageous. The great decrease in the use of the bicycles in America does not justify the construction of special cycle tracks.

In conclusion Mr. Lewis directs attention to the importance of making roads attractive in appearance as well as direct. He summarizes as follows the essential considerations which should form their planning:

(1) The road, while not monotonously straight, should be as direct as the topography and limiting grades will permit.

(2) Trunk lines, articulated with those of an adjoining jurisdiction, should form the basis of a complete road system.

(3) Detours from the general direction of trunk lines to reach unimportant towns are not justified; such towns can be served by branch roads.

(4) The principal streets of a city should form a part of the trunk system of the territory in which such city is located. Facility of movement between the city and surrounding country and neighboring towns is essential.

(5) The principal highways between neighbouring towns should connect directly with their most important and dignified thoroughfares.

(6) Roads should increase in width as they approach important towns, so that as the towns grow outward along these roads it will not be necessary to incur great expense in widening them.

(7) In establishing adequate roads radiating from important cities it is unnecessary to undertake expensive widenings of the streets of small towns or villages. By-pass roads around them will answer the purpose.

(8) At crossings or junctions of rural highways sufficient space should be added to the road to afford a view of approaching vehicles. Curves should be used instead of abrupt deflections. In city streets a widening at important junctions is always desirable.

(9) Tramways are inevitable in city streets, and the best location for them is in the middle of the roadway. When they follow rural highways they should be so separated from the travelled road that vehicles cannot pass from road to tracks, and they should never cross the roadway at grade.

(10) Roads should be made interesting where possible. Picturesque vistas and extensive outlooks are desirable as well as easy gradients and a smooth surface. The highway should promote health and pleasure, as well as business.

Types of Surfacing on Bridges, Viaducts, etc.

By Henry B. Drowne, Instructor in Highway Engineering, Columbia University.

Mr. Drowne confines his report to the question of the surfacing of the roadways, it not being possible, he says, to include the surfaces of footwalks, the various details of construction at the ends of bridges, the construction around car tracks and the different arrangements for drainage, which "without drawings would involve lengthy expositions." At the present time the following types of surfacing are found on bridges in the United States:—Plank, wood block, sheet asphalts, stone block, brick, concrete, various types of bituminous pavements, macadam, gravel and earth. These types are taken by Mr. Drowne in the order given. No consideration is given by him to bridges of stone masonry, concrete or reinforced concrete, which have an earth-fill between the wearing surface and the bridge proper, "since in such cases the same surfacing is generally used which occurs on the adjacent roadways, and the writer sees no reason to expect that the cost of construction and maintenance would be any different."

Plank Surfaces

Plank floors are generally constructed of white oak, spruce or yellow pine. The floors are constructed with either one or two layers of planks. One layer floors composed of planks having a thickness of 3 to 4 inches are more frequently found on unimportant bridges of short span outside of built-up districts. Where a two-layer floor is constructed on bridges of this class, the lower layer may be 2½ inches thick and the upper or wearing layer from 1½ to 2 inches thick. On city bridges, while the upper layer is usually about 2 inches thick, the lower layer is from 3 to 4 and more inches in thickness. The width of plank varies from 8 to 12 inches, the smaller width being preferred by some engineers. A variation of about 2 inches in excess of the specified width, however, is usually allowed for planks on any one structure.

The planks are supported on steel or wooden stringers and attached to the same by spikes, wooden spiking pieces being fastened to the tops or sides of the steel stringers for this purpose. The best practice usually requires that holes shall be bored for the spikes to prevent splitting the planks. It is also customary to lay the planks with the heart side down. When a two-layer floor is built the planks in one layer are usually laid at an angle of about 45 degrees to the centre line of the bridge. No very definite rules as to whether the diagonal direction shall be given to the upper or to the lower layer seem to have been established.

Plank floors built with one layer are not usually constructed with a crown but, in the case of two-layer floors, a crown is more essential. The desired crown may be obtained in any one of the three following ways: 1. The thickness of the spiking pieces, if same are used on the tops or sides of the stringers, may be decreased an amount commensurate with the desired crown progressing from the centre to the sides of the bridge. 2. The stringers may be shimmed up if they are supported on the tops of the floor beams so that their tops will correspond with the desired crown. 3. The stringers if framed into the webs of the floor beams instead of being arranged with their tops in the same level may have the end connections at different elevations which will make their tops conform to the crown desired. It is then an easy matter to spring the planks over the stringers, thus making the floor conform to the desired crown.

The life of a plank floor is extremely variable, depending principally upon the character of the traffic and its intensity and climatic conditions. It is self-evident that the effect of horse-drawn vehicle traffic is more severe than that of motor car traffic. If the planks are not worn out by the abrasive action of traffic, they are very liable to rot out in a few years in climates where they are alternately wet and dry. In speaking of the life of plank floors on bridges not subjected to severe traffic conditions, various authorities state that they may be expected to last from three to eight years, it being assumed that at the end of that time the planks will have decayed, if not previously worn out, so as to require renewal. A better idea as to the wear of this type of surface can be gained, however, from an examination of the following instances of construction.

A 3 by 12 inch white oak floor, one layer, spiked to 4 by 6 inch yellow pine spiking pieces resting on steel stringers was laid in 1893 on Bailey Avenue Bridge, Buffalo, N.Y. The original cost of the surfacing was $1.33 per square yard. Repairs have been made from time to time as they were needed, the contract price being $48.00 per thousand feet B.M. The traffic on the bridge, which is a 175 foot through truss, is light and the floor is considered to have been satisfactory. The wear near the car tracks, which are located at the centre of the bridge, has been somewhat greater than in other parts of the bridge. Due to the water passing through the joints between the planks, the steel stringers have become corroded to such an extent that they are now being replaced with those of wood.

The Randolph Street Bridge, Chicago, Illinois, built in 1893, is of the rolling lift type, the movable span being 210 feet long, with two roadways each 22 feet wide. In November, 1911, and in July, 1912, the north and south roadways respectively were rebuilt in the following manner: A wearing surface of 4-inch white oak planks was laid on a plank sub floor composed of 4 by 12 inch yellow pine planks which was supported on steel stringers. The oak planks were fastened to the sub floor by 80d. spikes. The cost of material used in the floor was $1.34 per square yard and the cost of labor, including the removal of the old Schuman pavement, was 85 cents, making a total cost per square yard of $2.19. The bridge is subjected to a heavy traffic and at the present time the north roadway is badly worn, while the south roadway is reported as being in good condition.

The plank floor of London Bridge in Concord, New Hampshire, is surfaced with a bituminous mastic of coal tar and sand. The floor consists of a wearing surface of 1⅞-inch dressed spruce laid on a 2⅞-inch dressed kyanized spruce sub floor which is supported on 4 by 14-inch hard pine joists. The wearing surface is covered with a mastic composed of hot sand mixed with a 1 to 1 mixture of coal tar and No. 4 paving pitch. This mixture is laid hot, depth not stated, and rolled with a hand roller. The cost per square yard of the bituminous mastic in place is 45 cents and the surface is maintained at the same price. The method was first tried in 1896 and the mastic has been entirely replaced three times since that date. The bridge is a three-span Pratt truss, approximating 500 feet in total length, and has an 18-foot roadway. It is reported that the traffic is heavy.

Wood Block Surfaces

Wood block surfaces are laid on a concrete base or on a plank sub floor. The concrete base may be formed on a buckle plate floor, it may be the reinforced concrete slab forming the floor, or it may be formed by concreting between steel I beams. The plank sub floor is built in a similar manner to the ordinary plank floor. Generally, however, it is composed of one layer of plank or timbers from 3 to 6 inches in thickness. Both treated and untreated timber is used in constructing the sub floor, but if untreated, it is usually waterproofed by coating it with hot asphaltic cement or by spreading over it several layers of tar paper well bonded together by a bituminous cement. Where a sand cushion is spread on the sub floor, it is essential that the floor has an even surface and that the joints between the planks are tight for unless these precautions are taken or a layer of tarred felt is interposed between the cushion and the sub floor, the sand will sift through the cracks, resulting in a consequent displacement of the surface. Sometimes the sand cushion is omitted and the blocks are laid directly on the base or a bituminous mastic or some other material is substituted for the sand cushion.

The construction of the pavement from this point is the same as it would be on the street. At expansion points in the floor or at the ends of the bridge the pavement usually ends against an angle and the expansion space is bridged over by a slip plate. Transverse expansion joints in the pavement other than those necessitated by the bridge superstructure are not thought to be necessary by some engineers, but longitudinal expansion joints next to the curb are always constructed. These joints are made from 1 to 2 inches wide and should be filled with an asphalt cement that is not so susceptible to changes in temperature as to become brittle in cold weather and to flow in hot weather. Pitch, asphalt, sand and cement grout are used as joint fillers. One trouble with pitch filler is that in cold weather it becomes hard and does not allow the pavement to expand. Several instances have been found where in cold weather the buckling of the pavement has been laid to this cause. It is apparent that in cold weather the steel will tend to contract and unless the pavement can move within itself, buckling is pretty sure to result. The base on which the wood blocks are laid, whether it is composed of concrete or planks, is constructed with a cross fall of the same amount as would be required in a pavement. As a rule the structures are stiff enough so that vibrations caused by traffic have little or no effect on the pavement. If a sand cushion is used, excessive vibration might cause a displacement of the cushion and a consequent disturbance of the surface. Blocks adjacent to car rails are sometimes forced out of place due to vibrations in the rails or in the tie rods connecting the rails.

The surface of a 100-foot girder carrying Sprague Avenue in Spokane, Washington, is composed of 3-inch carbolineum wood blocks supported on a sub floor of 4-inch planking. The sub floor was covered with tarred paper "to prevent the asphalt filler from leaking through when the joints were filled." The blocks are of tamarack, Norway or Puget Sound fir and are treated under pressure with at least 12 pounds of preservative per cubic foot. They were laid on a 1-inch sand cushion and the joints were filled with an asphalt cement, using about 15 pounds to the square yard. Two-inch expansion joints were left next to the curbs. The cost of the surface above the sub floor was $2.30 per square yard, the blocks costing $1.65 per square yard and the asphalt costing $26.50 per ton. This surface, which was finished in the summer of 1912, has been subjected to a heavy traffic and in the six months has shown no signs of wear. In some places, however, along the rails the blocks have raised vertically from ½ to 1½ inches, due to the movement of the rail stringers.

The Manhattan, Williamsburg and Queensboro Bridges across the East River, New York City, all have roadways constructed of wood block pavement. The first two are of the suspension type with total spans of 2,920 and 2,793 feet respectively, while the third is a cantilever bridge with a total span of 3,724 feet. The 35-foot roadway of the Manhattan Bridge is paved with creosoted blocks supported on a 4¾-inch creosoted yellow pine plank floor. The maintenance cost and durability of this construction has not as yet been determined since the bridge has only been partially opened to traffic for the past three years. The Williamsburg Bridge has two 20-foot roadways, both of which are surfaced with 4-inch creosoted yellow pine blocks, treated by the creo-resinate process. The sub floor which supports the blocks is composed of 12-inch steel channels which are laid close, side by side with the legs turned down on the supporting members below. The steel was treated to prevent oxidation and before the blocks were laid the surface of the channels was given a coating of hot asphaltic cement or the blocks were dipped for an inch of their depth in the same material and laid directly on the surface of the channels with no intermediate cushion. The joints were filled with an asphalt filler. Considerable trouble has been experienced in this bridge due to the buckling up of small areas in cold weather when the steel work has contracted. The heavy traffic also tends to spread the legs of the channels composing the subfloor with a consequent disturbance of the pavement directly above. This bridge takes a very heavy traffic and the floor has been in service for about nine years. The 53-foot roadway of the Queensboro Bridge is paved with standard wood blocks, laid on a ½-inch sand cushion which rests on a concrete surface formed on a buckle plate floor. The traffic on this bridge is also heavy and during the three and one-half years the roadway has been in service, it has been necessary to reset the blocks in small areas which have buckled up as was the case in the Williamsburg Bridge.

Sheet Asphalt Surfaces

Sheet asphalt surfaces are used for bridge floors and are constructed on both concrete and plank floors. The construction of the wearing surface is no different from that on the street surface. This type of construction seems to have been satisfactory in most instances except that where the pavement was laid contiguous to car tracks on the bridge, it gives trouble by heaving and disintegration along the rails. Unless the vibration in the bridge is excessive, no trouble from this standpoint arises.

There are twenty-one plate girder bridges, having spans from 34 to 96 feet and roadways 25 to 30 feet wide, in Newton, Massachusetts, on which a 2-inch asphalt wearing surface has been constructed. The base on which the sheet asphalt rests is formed by brick or concrete arches between I beam stringers and the asphalt surface was laid directly on this base without any binder course. Fourteen of these bridges were completed in 1895 and the present condition of the asphalt surface is described as generally good, with a few cracks. No substantial repairs have been made to date except on two bridges where the traffic was heaviest. The surfaces are subjected to a moderate amount of light and medium weight vehicles, both horse drawn and motor driven.

Clarissa Street Bridge in Rochester, New York, was originally constructed in 1892 with a wood block surface, 5-inch non-treated pine blocks, resting on a plank subfloor. The bridge is a 3-span latticed girder having a total length of about 385 feet. In 1899 the blocks had decayed so badly that their removal was necessary. A sheet asphalt wearing surface was then constructed on the original plank subfloor at a cost of $2.50 per square yard. A car track is situated on both sides of the roadway and the asphalt surface was built up to but not between the rails. The present condition of the surface is described as good, although some general repairs have had to be made from time to time, such work costing from $1.00 to $1.25 per square yard. The roadway traffic from a census taken for six consecutive days in 1910, over a period from 6 a.m. to 9 p.m., was as follows: 188 automobiles, 112 street cars, 134 horse drawn carriages, 225 light wagons, 356 trucks.

Post Street Bridge in Spokane, Washington, is of the steel arch type with a span of 240 feet and a roadway width of 22 feet. The double plank floor on this bridge was surfaced with sheet asphalt in the fall of 1909, the pavement being three inches in thickness, consisting of a 1-inch binder course and a 2-inch wearing surface. This structure takes a heavy traffic as it is near the down town district. From January, 1910, to January, 1912, it was subjected to an increased traffic on account of the reconstruction of another bridge in the near vicinity. Due to the lightness of the superstructure and the heavy loads carried, there is more or less vibration in the bridge which has caused the binder to creep on the plank base with a consequent rutting of the wearing surface. The original cost of the asphalt pavement was $1.20 per square yard. In 1912 some of the worn places were cut out and replaced with new asphalt at a cost of 65 cents per square yard. Although the present condition of surface is described as fairly good, the pavement has not as a whole been considered a success.

Stone Block Surfaces

Stone block pavement is not used as frequently for bridge floors due to its greater weight. In all of the instances reported this type of pavement was chosen because the bridges were on a grade and a pavement furnishing a good foothold was desired. The construction of the pavement itself is no different from that on the street.

A 55-foot deck girder, which is part of the Seneca-Smith Street Viaduct in Buffalo, New York, is paved with Medina sandstone blocks. The blocks are supported on a concrete base which is filled in over brick, arches between I beams. The floor of this bridge is on a 4 per cent. grade. The blocks which are about 6 to 7 inches deep were set on a 2-inch sand cushion and the joints were filled with gravel and asphalt cement. The surface was laid in 1898 at a cost of $3.32 per square yard. It is in fair condition at the present time, any necessary repairs being made as needed by the city's force at a cost of about 75 cents per square yard. The surface is subjected to a light business traffic of medium density.

The Cambridge Bridge in Boston, Massachusetts, has a roadway floor composed of granite blocks resting on a 1:2:5 concrete base formed on a buckle plate floor. The bridge is a series of steel arch spans, varying in length from about 101 to 188 feet, and the floor is built on 3 per cent. grades. The blocks are made of Cape Ann granite and were bedded in a sand cushion on the concrete base, the joints between the blocks being filled with pebbles and pitch. This surface was laid in 1907, and is in good condition at the present time except for slight depressions at the expansion joints of the bridge, which can probably be accounted for by the sand cushion working out or the copper flashing giving way at these points, thus allowing a slight settlement of the blocks. The cost of the surface above the concrete was $3.09 per square yard and no money has been expended to date for maintenance. The floor is subjected to a heavy teaming traffic.

The Charlestown Bridge in the same city is a deck plate girder viaduct consisting of 10 spans of 85 feet each and has a roadway 80 feet wide on a 3 per cent. grade. In this case the support for the granite block paving is a 6-inch yellow pine sub floor resting on spiking pieces which are bolted to the steel stringers. The sub floor was waterproofed with successive layers of pitch and roofing felt, a total of four layers of felt being used. On the last layer of felt was placed a 1-inch layer, compacted, of sand mixed with pitch in the proportions of 1 gallon of pitch to 1 cubic foot of sand. A sand cushion was spread over this surface on which the granite blocks were laid. Rockport granite blocks were used and the joints were filled with pebbles and pitch. The cost of this pavement, which was constructed in 1899, was $5.20 per square yard above the steel stringers. The surface is in excellent condition at the present time and no repairs have been necessary. A traffic census taken between the hours of 6 a.m. and 7 p.m. shows that the roadway is subjected to a traffic of 4,600 teams, including numerous heavy loads, and 1,500 street cars.

Brick Surfaces

The Huntington Avenue Bridge in Boston, Massachusetts, which is a 89-foot deck plate girder with a 75-foot roadway, is surfaced with this type of pavement. The reasons for using brick were that the bridge is in a locality surrounded by numerous hotels and a less noisy surface than granite block was desired; the large amount of traffic was such as to require a good wearing surface, it being chiefly light in weight except at times when loads may be very heavy. The sub floor in this bridge is concrete arches between I beams. The surface of the concrete was waterproofed by mopping it with a heavy coat of waterproofing asphalt upon which was placed four layers of roofing felt, each layer being mopped with the same waterproofing material. A thin sand cushion was spread on this surface upon which the bricks were laid. Expansion joints were left at the curbs and these joints as well as the joints between the bricks were filled with asphalt. "Mack" brick were used in this pavement and the cost of the surface above the concrete exclusive of the waterproofing was $1.80 per square yard. The surface was laid in 1909 and is at present in excellent condition, no maintenance work having been necessary. The old bridge in this same location and therefore subjected to the same traffic had a 2-inch wearing surface of spruce plank laid on a 4-inch spruce sub floor. The 2-inch surface had to be frequently renewed and patched and at intervals of five to six years, the 4-inch sub floor had to be replaced.

Concrete Surfaces

The use of concrete as a paving material has led to its use on bridges which have a sub floor of concrete. Usually a concrete wearing surface is constructed on the surface of the sub floor. This surface is sometimes further protected by a bituminous surface formed by coating the concrete with from about [illegible] to [illegible] gallons of bituminous material per square yard and then covering this surface with a coating of screened stone chips or coarse sand. No data has been received relative to the cost and wear of this type of surface.

Other Surfaces

Instances may be found where bituminous pavements and asphalt blocks have been used but the writer has not received any information as to the cost and wear of such surfaces. These surfaces are usually laid on concrete sub floors. Macadam and gravel surfaces are more frequently found on structures that have an earth fill over them.

Conclusions

With a very few exceptions the choice of the type of surfacing to be adopted is independent of the type of structure on which it is laid. In all movable bridges it is desirable to keep the weight of the floor down to a low limit since this will reduce the cost of the machinery necessary to operate the bridge and the cost of upkeep on same. In the case of movable bridges that assume a vertical position when open, as the rolling lift type, the floor besides being light must be of such construction that it can be rigidly attached to the bridge and thus eliminate any danger of movement when the bridge is in the open position. In long span important bridges the consideration of weight of the floor may be of importance in its effect on the cost of superstructure and thus have a bearing on the selection of the type of surface. The same consideration of weight has to be taken into account in the reconstruction of floors on existing structures where it is evident that a change from the original surfacing is desirable. It may frequently be found that if any other type than the original is to be used, it will be necessary to strengthen the floor system and sometimes the main members of the bridge may not be of sufficient strength to carry safely any increase of load over and above which they were originally designed for. That there is a great difference in the weight of the different types may be seen from the following figures: plank floors having a total thickness of about 4 inches weigh from 20 to 30 pounds per square foot; wood blocks on a subplank floor weigh from 40 to 50 pounds per square foot; concrete slabs are variable depending upon thickness but may be as much as 140 pounds per square foot; stone block surfaces on concrete may weigh over 200 pounds per square foot.

Outside of the considerations which have just been given the selection of the type of surface is largely based on the same factors that would govern the choice in the case of street surfaces. Briefly stated these factors are amount and character of traffic, grade, cost, maintenance, availability of materials, noise, and comfort of those using the surface.

The construction of one layer plank floors is not recommended since from the standpoint of cost they would be economical under a very light traffic and the seepage of the water through the floor is very liable to cause serious deterioration of the supporting members underneath. In constructing a two-layer floor there is no economy in making the wearing surface over 2 inches in thickness since the wear over the surface is not uniform and if a thicker wearing surface was used, it would become so uneven that its removal would be desirable even if not entirely worn out. Spruce, since it is cheap, is very frequently used for the wearing surface and, while the sub floor is sometimes of the same material, yellow pine is often used. The sub floor should be built of treated timber, but this is not so important in the case of a wearing surface, which is subjected to a heavy traffic, since it will wear out much more rapidly than it will rot out. The life of a 2-inch wearing surface under heavy traffic is about one year and under extremely heavy traffic is from four to six months. The life of a treated sub floor is probably from fifteen to twenty-five years. The cost of renewing a 2-inch spruce wearing surface is from 70 cents to $1.00 per square yard. The disturbance to traffic where frequent renewals are required should be thought of. Where the construction of some other type of wearing surface is feasible, a comparison of the cost of the plank wearing surface should be made with that of other types to see which is the more economical. No trouble seems to have been experienced from the standpoint of corrosion of members underneath the floor when a two-layer floor is built. Further work should be done in experimenting with bituminous surfaces on plank floors and in investigating the economy of this treatment. New short span highway bridges, particularly those outside of built-up districts, in the writer's opinion are best constructed with some type of concrete sub floor on which any kind of wearing surface desired may be constructed.

A wearing surface of creosoted wood blocks is thought by many prominent engineers to be the ideal surface for bridges where the grade and traffic conditions will permit or warrant its use. This is the type now recommended by the Chicago Bridge Department for all bridges of both fixed and movable spans in that city. It is also recommended by the Illinois Highway Commission as a wearing surface on long span steel structures. It makes possible the attainment of a very durable and noiseless surface without increasing the weight of the floor to any extent over that of a plank floor. The success of constructing the block wearing surface on a creosoted sub floor seems to have been pretty well established. The blocks should be treated and the waterproofing of the sub floor is advisable since it will prevent corrosion of the supporting members underneath and hence a disturbance of the sub floor to remedy such a defect. One instance was cited where this type of surface is still in excellent condition after being subjected to a heavy mixed traffic for seven years and no maintenance work has been necessary. The pavement on the Williamsburg Suspension Bridge, New York City, is another example of long service of wood block, this surface having been down for nine years and outside of some repairs due to expansion and the settlement of the supporting members, has required no other maintenance. Untreated blocks on Rush Street Bridge, Chicago, which takes a very heavy traffic, lasted three, five and nine years. Considering the cost of the block wearing surface above the sub floor to be from $2.50 to $3.00 per square yard and if we assume that its life under heavy traffic may be only ten years, it is apparent that, even with a reasonable maintenance cost, it would be much cheaper than a plank wearing surface which in this same time would probably have to be renewed ten times.

Asphalt surfaces under a light traffic seem to have been fairly successful, the oldest surfaces of this type cited being those in the City of Newton, several of which have been down for seventeen years and have not required any substantial repairs. In this instance, however, the surfaces were laid on solid floors. In another instance cited the wear of an asphalt surface on a solid floor under heavy traffic was estimated to have been double what it would have been under simliar traffic conditions on the street. If laid on a sub floor of plank and there is any vibration in the floor good results cannot be expected. No conclusions as to cost can be drawn due to lack of definite data.

For short span bridges stone block pavements on both concrete and timber sub floors from the instances described seem to be entirely successful for heavy teaming traffic. It is economical in first cost, wears well and on gradients gives a good foothold for horses. In the bridges described the maintenance costs have been either very slight or nothing at all and the surfaces are in good or excellent condition. The writer believes that the joints should be filled with a soft filler rather than a cement grout. The plank sub floors on some of the Boston bridges, waterproofed with several layers of felt and a 1-inch layer of bituminous mastic, have been found in certain instances to be in perfectly good condition after twenty to twenty-five years service.

Brick surfaces also seem to have been successful. The meagreness of data, however, concerning this type as well as some of the other types not described prevents drawing any definite comparisons.

The final conclusions of the writer are that if the support furnished the surface is unyielding, the wear of the bridge surfaces of wood block, sheet asphalt, stone block, brick and other similar types is not any different than it is under the same conditions on the street; that the construction of plank surfaces is rarely economical and their use should be generally abolished, where it is possible to use any other type.

Bituminous Surfaces and Bituminous Pavements

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Bituminous concrete pavements which have been used in the United States during the past three years and of which broken stone forms an integral part may be grouped in three classes dependent upon the character of the mineral aggregate.

Type A consists of so-called one size crusher run broken stone mixed with bituminous material. This description of broken stone refers to the product obtained at a crushing plant, which passes over a screen having holes of one size and through a section of screen having the next larger size holes, or which passes through a screen of one size of holes and is retained upon a screen having smaller holes.

Type B consists of one size crusher run broken stone as defined above and sand or other fine mineral matter mixed with bituminous material.

Type C consists of a predetermined graded aggregate usually composed of broken stone and sand, with or without other mineral matter mixed with bituminous material.

The types of bituminous concrete pavements described will be considered from the standpoints of all of the topics listed in the "Program of Questions." The discussion of bituminous surfaces will be limited to those topics which refer to this class of construction.

1. Foundations and Drainage

The following statements contained in the 1912 Report of the Special Committee on "Bituminous Materials for Road Construction" of the American Society of Civil Engineers embody the underlying principles of the best current practice relative to foundations, subdrainage and surface drainage.

"Sub-Grades and Foundations.—Your Committee believes that the use of any form of a bituminous wearing surface does not preclude the necessity for the construction of a well-drained, thoroughly compacted, and adequate subgrade. In fact, such improvement of the road surface frequently attracts heavier traffic, and thus increases the stresses in the sub-grade."

"Crown.—The investigation and observations of the

Committee to date have convinced it that the crown generally used in the construction of macadam roads is excessive when bituminous materials are used, and that a crown of even one-half inch to the foot should be avoided when a lesser crown can be secured without detriment to the surface drainage."

The above report will hereinafter be designated as the "Am. Soc. C. E. 1912 Report."

2. Sizes and Shapes of Broken Stone for Bituminous Bound Surface Crust

Bituminous surfaces have proved more efficacious when constructed on macadam roads composed of well compacted and thoroughly bonded broken stone ranging from ¾ inch to 2 inches in the wearing surface than when the stone is of smaller dimensions. The size of stone is usually obtained by passing over a screen having 1¼ inch holes and through a screen having 2¼ inch holes.

Bituminous concrete pavements. Type A. The best results have been secured by using a mineral aggregate composed of broken stone varying in size from stone passing a 1¼ inch laboratory screen to a small amount passing a ¼ inch screen. This product is usually obtained from the ordinary type of crushing plant, from stone passing over a ½ or ⅝ inch screen and through a section of a screen having holes 1¼ inch in diameter. A typical analysis of such a product follows:

Per cent. passing ¼ inch screen	25.1
Per cent. passing ½ inch screen	24.3
Per cent. passing ¾ inch screen	10.7
Per cent. passing 1 inch screen	17.3
Per cent. passing 1¼ inch screen	2.0

The following excerpt from the "Am. Soc. C. E. 1912 Report" bears especially upon the construction of Type A: "Your Committee recommends that trap rock in sizes greater than that passing a 2-in. screen should be used with caution in the construction of the upper course, unless the voids of the same are properly reduced, because of the liability of the individual stones to rock under traffic."

Type B. The mineral aggregate has been composed of a combination of one size crusher run broken stone and one or more grades of sand or stone screenings. The mechanical analysis of a typical combination covered by the description, two parts trap rock passing a one and one quarter inch ring with a maximum of five per cent. dust and one part sand, follows:

Per cent. passing 200 mesh screen	3.3
Per cent. passing 80 mesh screen	6.9
Per cent. passing 10 mesh screen	29.7
Per cent. passing ¼ inch screen	25.1
Per cent. passing ½ inch screen	24.3
Per cent passing ¾ inch screen	10.7

Type C. One class of mineral aggregate which has been used to a considerable extent during 1911 and 1912 is known as the "Topeka" grading and is usually composed of broken stone and sand, with or without a filler of fine material. The grading for this mixture is covered by the following limitations in the mechanical analysis

Per cent. passing 200 mesh screen from	5 to 11
Per cent. passing 40 mesh screen from	18 to 30
Per cent. passing 10 mesh screen from	25 to 55
Per cent. passing 4 mesh screen from	8 to 22
Per cent. passing 2 mesh screen less than	10

Many bituminous pavements of Type C with proprietary names are laid in the United States. Among these may be mentioned "Bitulithic" and "Warrenite."

3. The use of Partially Worn Materials in Bituminous Bound Surface Crusts

The universal practice has been to condemn the use of materials, which have been previously employed, for the mineral aggregate in the construction of bituminous concrete pavements.

4. Thickness and Composition of the Strength Crust and of the Super or Wearing Crust Under Different Conditions

Bituminous Surfaces. A thin coat of the proper kind of bituminous material has given better satisfaction than the formation of a comparatively thick carpet, especially when the surface is subjected to excessive horse drawn vehicle traffic.

Bituminous Concrete Pavements. Type A is usually laid upon a foundation course (strength crust) of broken stone having a thickness varying from four to eight inches. Type B is laid on a broken stone foundation course as indicated for Type A or a cement concrete foundation, five to six inches in thickness. Type C is laid on a broken stone or a cement concrete foundation as mentioned for Type B. It is being recognized as a fundamental principle that where Type C is used under conditions which render it economical and suitable, only the cement concrete foundation should be employed. The necessity for constructing strong foundation courses due especially to the rapid development of motor truck traffic is apparent. For Types A and B the thickness of the wearing surface has varied from 1½ inches to 3 inches, the average being 2 inches. For Type C, when a fine material aggregate is employed, 1½ to 2 inches has been used, the best practice favoring 2 inches. Pavements with mineral aggregates having larger broken stone are generally laid 2 inches in thickness, although 3 inches has been used in some cases.

5. Life of Surface Crust Under Different Conditions of Traffic, Weather, Subsoil, Etc.

Bituminous Surfaces. The life depends primarily upon the character of the material and the amount and kind of traffic. Bituminous surfaces on macadam roads have a life of from one to three years and on bituminous concrete pavements from one to five years.

Bituminous Concrete Pavements. As with all types of bituminous pavements, the life of the wearing surface depends, to a large extent, upon the character of maintenance. Granted proper construction, including adequate foundations and drainage, and continual maintenance, which includes the use of seal coats applied periodically, the life of bituminous concrete pavements, based upon such information as is at hand, may be estimated as from twenty to twenty-five years. This estimate is based upon the supposition that the various types of bituminous concrete pavements are used under conditions for which each is suitable. More definite information is at hand covering the life of pavements which have not been maintained. The following estimates cover average life without maintenance: Type A, four to ten years; Types B and C, seven to fifteen years.

6 and 7. Relative Importance of Patching, Repairs and Periodical Renewals of Surface Crust. Extent to Wear Permissible Before Renewal of Surface Coating

All types of bituminous surfaces and pavements are liable to develop weak spots. Patching in these cases is found to be economical and practical as it is comparatively simple to replace a portion of a bituminous concrete pavement or a bituminous surface on a macadam road. Likewise periodical renewals of bituminous surfaces are efficacious. This method of repairing will be economical until such time as the pavement begins to generally wear out or disintegrate.

8. Measurement of Wear and Appliances Used for this Purpose

Work of this character on bituminous concrete pavements has been limited to that of a few investigators, all of whom have used the method of periodically taking accurate elevations in order to determine the amount of wear.

9. Various Methods of Bituminous Treatment

Mixing Methods. In 1910 practically all of the bituminous pavements of Type A were constructed by hand mixing methods. In very few cases was the broken stone heated. During 1911 and 1912 there has been a general abandonment of hand mixing methods and a substitution therefor of various machines especially designed for the heating of the mineral aggregate and the mixing of it with bituminous materials. The introduction of these machines has made possible the use of the most suitable types of bituminous materials. Generally this type of mineral aggregate is mixed in portable mixing plants at the road side.

The mineral aggregate of Types B and C of pavement has during 1911 and 1912 been universally mixed in a special machine designed to heat the mineral aggregate and mix with it the bituminous material. The location of the machine depends upon local conditions. In some cases the mixing plant is located at a railroad siding at which both the broken stone and the bituminous material are available, and in other cases, near the road to be constructed. In some instances large mixing plants have been installed in municipal yards. Type C is also manufactured in the form of asphalt blocks at factories. The following reference to heated aggregates in the "Am. Soc. C. E. 1912 Report" is pertinent:

"Your Committee recommends that in the use of a heated aggregate for the construction of a bituminous pavement, non-uniformity or excess in the heating of stone, such as usually occurs with the use of flat plates or similar crude appliances for this purpose, should be avoided."

All of the above types have been constructed with and without a seal coat of bituminous material. The best practice, however, favors the use of a seal coat.

Carpeting Methods.—In the case of macadam roads, the mode of procedure is to clean thoroughly the surface by sweeping with hand bass brooms or horse sweepers or a combination of these methods. The bituminous material, which is generally heated, is applied to the surface with the aid of pouring cans, hose attached to gravity tanks, hand drawn gravity distributors, horse drawn or power driven gravity distributors and pressure distributors. After a varying interval, some kind of mineral coating is generally applied to cover the bituminous material. The construction of bituminous surfaces on bituminous concrete pavements during the construction of the latter is usually accomplished by the use of brooms, squeegees or hand drawn gravity distributors. For the periodic application of bituminous materials all the above methods are used.

10 and 11. Relative Advantages and Use of Tar, Tarry Compounds, Asphalt, Bitumen, and Other Materials. Tests and Chemical Analysis of Tarry, Bituminous and Asphaltic Compounds

Bituminous surfaces.—Since 1910 there has been slowly crystallizing an objection to the use of bituminous materials on macadam roads which require from one to three weeks to "set up" to such an extent that tracking will not occur. Refined coal tars and water gas tars, combinations of asphalts and tars, and certain asphalts have given satisfaction in this respect as they have "set up" satisfactorily within six to forty-eight hours. Usually about one half gallon per square yard has been used which has been applied either in one or two applications. In the construction of bituminous surfaces at the time of the building of macadam roads, it has been found possible to employ the same grades of asphalt as are employed in the construction of bituminous pavements by penetration methods, provided large stone is used in the surface and the latter is dry and thoroughly broomed.

Bituminous Concrete Pavements.—In the construction of both the mix and the seal coat of Types A, B, and C, asphalts, possessing the proper physical and chemical properties, have given excellent results. Coal gas and water gas tars have been used in the construction of Type A and to a very limited extent in the construction of Types B and C. In the construction of Type A, coal tar has been used in the mix and an asphalt for a seal coat with satisfactory results. The use of high carbon tar of a certain consistency does not appear to give satisfaction as a seal coat when the traffic includes many horse drawn vehicles. Compounds of asphalt and tar have been used in the construction of Type A and to a limited extent in the construction of Types B and C.

The amount of bituminous material used is expressed as either so many gallons per square yard of wearing surface or as a given per cent. by weight of the mix. In the various types mentioned, the amount of bituminous material used varies from five to ten per cent. by weight.

12. Climatic Effects Causing Slipperiness of the Roadway. Remedies.

In some cases bituminous concrete pavements with seal coats of tar and certain grades of asphalt have been slippery, especially in cold weather. Many types of bituminous pavements are rendered non-slippery by the application of an additional covering of stone chips or pea gravel.

13. Effect on Public Health, Fish Life, or Vegetation

The effect of using bituminous surfaces and bituminous pavements has been beneficial from the above standpoints except that the odors characteristic of certain asphaltic oils are obnoxious.

14. Specification of the Methods of Construction

Detailed specifications have been drawn up covering the construction of bituminous surfaces and the various types of bituminous concrete pavements referred to above. These specifications generally cover the quality and size of the various components of the mineral aggregate, the physical and chemical properties of the bituminous material and detailed descriptions of the methods to be used in mixing and in the laying of the wearing surface. Typical detail descriptions of methods are covered by the following references. Bituminous surfaces: Trans. Am. Soc. C. E. 1911, vol. LXXIII, pages 44-73, and 1912, vol. LXXV, pages 548-571. Bituminous concrete pavements. Types A, B and C: Trans. Am. Soc. C. E. 1911, vol. LXXIII, pages 99-135, and 1912, vol. LXXV, pages 572-648. Type A: Borough of Queens, N.Y., Special Report, 1912. Type B: 1911-1912 Specifications, Washington, D.C.; 1912 Specifications, Lincoln Park, Chicago, "Good Roads" April 6, 1912. Type C: 1911 Specifications, Borough of Richmond, N.Y.; 1912 Specifications, Borough of Queens, N.Y.; 1912 Specifications, New York State Highway Commission; 1912 Specifications, City of Philadelphia.

15. Cost Data

Bituminous Surfaces.—The average cost of constructing a bituminous surface, using 0.5 gallons per square yard with either an asphaltic or a tar product or a combination of the two, is 7 cents per square yard.

Bituminous Concrete Pavements.—Besides variations dependent upon local conditions, the cost varies with the kind and quantity of the bituminous material used, the character of the aggregate and the type of construction employed. Type A.—Using an aggregate of one size crusher run stone mixed with 1.5 gallons of bituminous material per square yard of 2-inch wearing surface and a flush coat of 0.75 gallons per square yard, the cost varies from 25 to 35 cents in excess of water bound macadam. Types B and C.—The cost of pavements with mineral aggregates of broken stone and sand, with or without other fine material, varies from $1.00

to $2.25 per square yard including the foundation course and light grading.

16. Cleansing and Watering

Bituminous surfaces and bituminous concrete pavements, constructed on highways outside built up districts when subjected to considerable motor car traffic are found to remain clean and practically free from dust. When subjected to excessive horse drawn vehicle traffic in suburban or urban districts, the practice of periodical flushing at night has proved efficacious. Sprinkling with water bituminous surfaces and bituminous concrete pavements is universally condemned as tending to shorten the life of pavements and as being characteristic of uneconomical administration of street cleaning.

Bituminous Pavements—Penetration or Grouting Method

By Major W. W. Crosby, M. Am. Soc. C. E., Chief Engineer Maryland Geological Survey, Consulting Engineer, Baltimore, Md.

With the construction in open country of macadamized roads bound with tarry, bituminous or asphaltic materials by the "Penetration" or "Grouting Method," it seems (says the author, whose paper we reproduce in extenso) that the best modern practice in the United States of America has now crystallized along the following lines:

1. Foundations and Drainage

The necessity for firmer and stronger foundations, and, to this end, for the best possible sub-drainage, seems to be fairly widely and generally accepted, especially by those whose vision into the future is keen enough to permit them to recognize the probable increase in the demands on the foundations, to be brought about by better surfaces and by the consequent growth in both the amount and weight of traffic as well as in its severity. This necessity is even more apparent when the penetration method of constructing the crust is used, because of the fact that such a crust appears to have frequently less inherent rigidity than many built by the Mixing method.

2. Sizes and Shapes of Broken Stone for Bituminous Bound Surface Crust

While the mixing method may require a combination of different sizes of broken stone for the best results, with the penetration or grouting method under discussion, this is not the case. The unscreened product of a crusher is often used quite satisfactorily for the bottom course of the crust, though this course is frequently just as satisfactorily built of the coarser portions of this product. The choice depends on local conditions. It is considered inadvisable, however, to allow any particles over three inches in length in this course.

In the second or wearing course, it is the best practice to pay considerably more attention to the screening and sizing of the stone particles. Very good results have been obtained by the use for the second course of cleanly screened stone passing a 1¾ inch round opening and not able to pass a ¾ inch. Apparently better results have been secured by the use of pieces passing a two inch and retained on a one inch screen, and very good results seem to have been secured, where the pieces were most cubical, by the use of stone passing a three inch, and retained on a two inch, screen. More uniformity of grouting, together with longer wear, seems to be secured by the use of the larger sizes, and, further, a surface built of the larger sizes seems better able to withstand without damage the crushing strains of the heaviest loads carried on hard tyres.

It has not been the best practice to permit too great a difference between the sizes of the screens used for separating the material for this course, about one inch being the customary difference in diameters of holes and one and one-half inches, the maximum. A greater difference seems to contribute toward lack in that much-to-be-desired uniformity of grouting and this is especially noticeable in stone breaking into scaly pieces.

The writer believes that with a fairly cubical broken stone the best results have been obtained by the use of screens 2½ inches and 1½ inches in diameter of openings and that in the case of shaley rock 2 inches and 1 inch have given the best results. Reference has been made to "cubical" and "scaly" or "shaley" stone. There is general agreement that stones breaking cubically, without glassy fracture—that is, with fairly rough surfaces—and with sharp angles are most desirable.

3. The Use of Partially Worn Materials in Bituminous Bound Surface Crusts

From the foregoing (2) it will be seen that partially worn materials are usable for the bottom course of the crust, and they are frequently so used. Experience shows that such use should be accompanied by proper regard for the segregation, by harrowing or screening, of the fine material and detritus generally present with the coarser sizes. But the use of even the carefully separated coarser sizes of the old worn material is not generally permitted for the upper course of the crust as it is considered dangerous to successful results.

4. Thickness and Composition of the Strength Crust and of the Super or Wearing Crust Under Different Conditions

So much depends on the particular conditions of the individual case that a general statement on this point is, with difficulty, made of any value. In addition to what has already been stated regarding sizes and shapes of the pieces of stones, it may be further said that the bottom course varies from a minimum thickness of perhaps two inches to a maximum of eight inches, measured after compaction. The average is probably from four to five inches. This course is built both with and without the addition or presence of fine material (passing a ¾ inch or ½ inch screen) as local conditions seem to determine, though it seems that the proper use of a moderate amount of the smaller material generally produces a firmer and stronger first course. Occasionally the completed bottom course has been given a coat of pitch before spreading the upper course stone, but ordinarily this use of the pitch is not followed, nor does it generally seem to be considered necessary to endeavor to secure any penetration of the pitch to the bottom course through the upper course stones.

The super or wearing course, it may be said, is generally from two to three inches in thickness after rolling. For the proper penetration and adherence of the bituminous material or pitch of whatever nature, it is now generally agreed that the particles of stone must be clean and free from coats of stone-flour, dirt or dust. Apparently a general preference exists that they should also be dry but there is still much discussion on this latter point, and it is by no means determined what lack of dryness can be permitted without detriment to the results. A very few have even advocated the presence of a certain amount of moisture on the stone before the application of the pitch, but the writer prefers a dry condition, though he agrees that, in most cases, a moderate amount of moisture is not as objectionable as dirtiness or dustiness.

Another most important factor affecting both the courses of a bituminous as well as of a water bound road crust is the sufficiency of the rolling given them. So generally is it now accepted that with water bound macadam the utmost possible compaction and interlocking of the stone by rolling is necessary for first class results, that the truth of the saying that "Rolling is the life of the road" is everywhere recognized. With bituminous macadam built by the penetration method, the concordance on this point seems to be as yet less complete. Some road-builders actually insist on a minimum of rolling before the application of the pitch and others do not require a maximum. With the writer's work, however, there is no question but that the quality of the results has been in direct proportion to the amount of compaction or interlocking secured by proper rolling, and it is his opinion that results generally show that the proper rolling of the stone before the application of the pitch is of the greatest importance.

5. Relative Advantages and Use of Tar, Tarry Compounds, Asphalt, Bitumen and Other Materials

The proper selection of the bituminous material or pitch for use under the penetration or under any method, is a most serious one and is influenced by many conditions other than method of use. Such, like price, soil, weather and traffic conditions, desires of users of, and abuttors on, the road, the conditions likely to prevail regarding after-maintenance and cleaning, etc., etc., are largely local, and are probably not germane to the discussion in this paper. Confining the statements to the subject (5) and considering only the penetration method of use, it may be said:

The use of unrefined tars has been found unsatisfactory and has been practically abandoned. The extent and character of the refining seems to depend largely on the peculiar conditions to be expected in any case of the use of the material, but some points in this connection are still unsettled. It seems generally agreed that the presence in the tar of more than a minimum of water or amoniacal liquor renders it undersirable for this method of use, that certain amounts of "light oils" are necessary for giving to the pitch the desired fluidity in handling; that a generous proportion of "middle" and "heavy" oils—especially the latter—is demanded, in order that the tar may retain the longest possible "life" or elasticity after use and under the aging or weathering effects of weather and traffic as well as for giving the "body" to the pitch demanded by this method; and that a limited amount of "free carbon" may be advisable in order to help to give body to the tar and to assist in reducing its susceptibility to changes in temperature. This "free carbon" (matter insoluble in carbon bisulphide) may be either the natural fraction of the tar or it may be added foreign material such as Portland cement or finely powdered limestone. Some crusts built by the penetration method with a low carbon tar have seemed to improve as fine material was supplied by traffic.

As first an opinion existed widely that the value of a tar for road work was in inverse proportion to its percentage of "free carbon" content, but the writer was loth to accept this view because of his knowledge of the proved great value of certain tars in which this fraction was unusually high. Results of practice with the penetration method to date seem to indicate that it is not the simple proportion of the "free carbon" fraction to the whole tar which was of use as a criterion in passing on the value of the tar for the penertation method, but rather the ratio between the "free carbon" fraction and one or more other fractions (the heavier oils) on which depends the worth of the whole tar.

The use by the penetration method of tars with a "free carbon" content of less than two per cent. has resulted in an objectionable susceptibility of the road surface to summer heats, while the use of tars whose "free carbon" fraction was greater than the percentage of the heavier oils in the same tar has shown a too great hardness or friability under extreme cold.

In the use under the penetration method of the native asphaltic materials and of the oil residuums, a certain amount of "light oil" seems desirable for the sake of fluidity, and a limited amount of "middle" and "heavy" oil fractions for the sake of "life" and elasticity. The "pitch" fraction, being the base in those cases, must possess the desired characteristics of adhesiveness, cohesiveness, lack of brittleness and resilience. The proper proportions of the lighter fractions depend on the characteristics, in these particulars at least, of the "pitch," as well as upon the conditions of traffic, etc.

Early practice under the penetration method condemned the use of "cut back" products—i.e., those artificially prepared by the addition of oils to previously reduced pitches—probably because in many cases such pitches had not been carefully prepared with this end in view but were by-products or wastes from processes arranged for the production from the raw material of the portions other than the pitch.

The writer believed that not only was it possible to make satisfactory road compounds for use under this method from a pitch by cutting it back with lighter materials, but also that it was quite possible that, in many cases, a far more satisfactory product could thus be obtained than by simple reduction, to the desired consistency, from the raw material.

Subsequent experience has seemed to confirm this theory and some of the most satisfactory results under the penetration method have been secured by the use of pitches compounded by adding the necessary oils to a previously, and purposely prepared, fairly hard, asphaltic pitch.

In such cases, the harder pitch possessed all the usual qualities of a good asphaltic paving pitch and the flux, those of a proper flux for making asphaltic cement, except that perhaps more volatile oils were included to permit of easier and better use under the peculiarities of the penetration method. Experience seems to have proved that there is a limit to the amount of "greasiness" that can safely be permitted in the flux so—as above—used and that an excess of this characteristic may ruin the results under this method by permitting, if not encouraging, internal motion between the coarse particles of the crust, especially in the usual case of a deficiency of the smaller sizes.

In the use of the materials referred to, so much depends on the peculiarities of the local demands that brief general statements are again somewhat difficult. A few such may, however, be justified. For instance, experience has seemed to prove that in the use of tars or tar-compounds under the penetration method, better results have been secured where the softer materials have been used provided such softness was not secured by an excessive proportion of volatile or light oils. This seems especially true when considering the tendency of certain pitches to produce surfaces slippery in wet or cold weather.

As regards asphaltic materials (including oil residuums) it seems that in many cases where softness has been given by a generous amount of the middle oils (non-volatile) the resulting surfaces under this method have shifted under traffic in warm weather and evidenced "lubricating rather than the necessary binding" characteristics of the pitch compound.

Regarding the quantity of pitch to be used under the penetration method, while the character of the wearing course (as to sizes, kind, etc., of the material) will affect the decision, it may be stated that ordinarily the successful amount of bituminous material per square yard of surface seems to have been between 1½ and 2 gallons. The writer has built entirely satisfactory work with as low as 1¼ gallons per square yard, but under exceptional conditions. He has also seen instances where as high as 4½ gallons per square yard of tar were used, but with little dissatisfaction with the resulting surface. In fact, the main objection that appeared in those latter cases came from some bleeding of the pitch over the road surface during the first summer after construction, and this was readily obviated by one or two additional coatings of stone chips.

It has been suggested that an excess of pitch in the crust, provided it is located well down in the latter, may be of some decided advantage in that it may furnish a reservoir from which additional life will be given to that pitch exposed on the surface to deterioration by traffic and weather. However, penetration of the pitch to the bottom of the larger sized stone in the surface seems ordinarily to be sufficient for success.

Practice has varied in the application of the pitch under the penetration method, some applying the bulk (say, ¾ of the total amount) at first and then, after spreading a coating of chips and rolling, applying the balance with another coat of chips and more rolling. Others apply all the pitch at once. The writer concludes from his observations and experience that the latter way generally gives more satisfactory results.

With the mixing method, where the quantity of pitch may be reduced to a minimum, certain conditions may render advisable a "flush coat" of pitch and chips. But "in open country" where even slight dustiness may not be objectionable and where slipperiness may be decidedly offensive, the omission of the flush coat is generally, under the penetration method, better because of the longer freedom from unnecessary smoothness. And the writer has not found that the omission of the flush coat has, where the road crust was properly built by this method, rendered the crust visibly more susceptible to the destructive effects of either horse-drawn vehicular or motor traffic.

It seems generally admitted that with the penetration method the use of a "flush coat" is mainly for "insurance,"—i.e., to overcome or make good any defects from previous poor workmanship or inequalities in the earlier processes.

Uniformity of grouting has been referred to as desirable, and is now generally so recognized. Toward this end as well as for the sake of economy, efforts have been made to supplant the early system of hand-pouring by some mechanical distribution of the pitch. Some very successful machines have been devised for the purpose and it seems generally agreed that the best results under the penetration method are secured by the use of such appliances distributing the pitch under pressure of from twenty to seventy pounds per square inch.

6. Cost Data

The usual variation in cost, resulting from different local conditions, have been omnipresent with the penetration as with any other method. However, it may be stated that with labor at 15 c., single horse carts at 27½ c., two horse carts or wagons at 50 c., foremen at 30 c. per hour, stone at $1.75 per ton delivered on the work, and pitch at from 7 c. to 10 c. per gallon delivered at a railway station within one mile of the work, the cost for building by the penetration method a pitch bound macadam using from 1¼ to 2¼ gallons of pitch per square yard averages between 15 c. and 25 c. per square yard over and above the cost of building water bound macadam under the some conditions. A decrease in this cost has quite steadily occurred and it seems may be looked for further as proficiency in practice and as mechanical appliances for the work are developed.

Tests of Materials Used in Construction of Macadamized Roads

By Logan Walter Page, Director U. S. Office of Public Roads, Washington.

Assuming that a macadamized road has been the proper selection of pavement for the conditions of traffic which it is to carry (says Mr. Page in introducing his paper), and assuming that proper constructive methods have been used in its completion, there remains no element more contributary to its success or failure than the ability of the rock entering its construction to resist the destructive influences to which it is subjected.

There are two methods for judging of the suitability of a rock for use in the construction of a road. Either, observations may be made on a road constructed of the same material and subjected to approximately the same conditions of traffic, or the rock may be subjected to artificial conditions designed in the laboratory to approximate those met on the road. The first method, that of the observation of a road already constructed, is, however, not of positive value unless assurance can be had that the material to be used in the new construction is of the same character as that in the road under observation, and this assurance can only be had by a comparison of the physical characteristics of the rocks obtained through laboratory tests. From past general observations of the behavior of different kinds of rocks in service, and by a comparison of these observations with the physical qualities of the rock obtained in the laboratory, very convenient means are furnished for judging from the results of the laboratory tests of the probable adaptability of the rock for use in the road under construction.

Road Destroying Influences

The rock in a macadam road should be selected to successfully combat the agencies which attack it with destructive effect. The three main classes of destructive agencies are: (a) Mechanical; (b) Chemical, and (c) Physical.

A.—**Mechanical Agencies.**—Subjected to the impact and grinding action of traffic, the individual particles of rock are disrupted and their surfaces are ground away with a consequent formation of dust. At the same time there is a tendency to loosen the road surface through the rolling and shearing action of horses hoofs and wagon wheels. To withstand these influences, the rock must be tough in order that it may not break into smaller particles, and it must be hard in order that it may not grind to dust too readily. The dust formed by traffic serves as a binder or cementing agent to hold the larger particles together and is a necessary part of the material in the body of the road. This fine material is carried away to some extent by the winds and rains, while part is retained on the road. Should the rock be too soft, more fine material will be formed than can be carried away by the mechanical action of the winds and rains and in a short time the surface becomes muddy and dusty. On the other hand should the rock be exceedingly hard and tough, too little fine material will be formed to replace that dispelled by the winds, and washed away by the rains; the road is thus deprived of its binding material and in consequence the surface becomes loosened, or the road "ravels." Automobile traffic exerts a severe shearing action on the surface, loosening it and failing to supply, by abrasion, fine material to replace that lost in the clouds of dust raised by this class of traffic. Plain macadam roads are therefore not suitable for automobile traffic and recourse must be had to bituminous or other binders when many automobiles are to be carried.

B.—**Chemical Agencies.**—All rain water and surface water contain carbonic acid and act, to some extent, in dissolving the carbonates of lime and iron in the materials of the road. The humus acids of animal and vegetable decay are likewise effective, to some extent, in dissolving some of the rock forming materials containing magnesia, potash, soda, lime, iron and silica. In comparison with the destructive effect of traffic however, chemical action is practically negligible.

C.—**Physical Agencies.**—If the surface of the road is porous or if poor drainage is provided, the disrupting influence of frost on the body of the road may be quite severe although its effect on the stone itself, in comparison, is of small moment. It is thus evident that a dense impervious surface should be the aim in construction, and this can only be obtained by the use of a material, the dust of which, possesses inherent cementitious qualities.

Physical and Mechanical Qualities of Road-Building Materials

The mechanical agencies are by far the most severe in causing the disintegration of the macadam road surface, and the laboratory tests are therefore designed to approximate the destructive effects of these agencies. The traffic pounds up the rock to dust and the winds and rains wash away this dust depriving the road of its binding material and enabling traffic to exert further destructive effect in loosening the unbound stone. Moreover the surface, thus loosened, is subjected, particularly if it is poorly drained, to soaking from long rains, and frost action is thus permitted to work with increased disrupting effect on the body of road.

The three prime requisite qualities to be possessed by road-building materials are, as has been indicated, those of (a) hardness; (b) toughness, and (c) high cementing value.

(a) By hardness of a rock is meant its ability to withstand the displacement of its surface particles through friction.

(b) The toughness of a rock is a measure of its ability to resist fracture from the effects of impact.

(c) The cementing value of a rock dust measures the ability of that dust to hold the individual particles together to form a firm impervious road surface. These physical properties of hardness, toughness and cementing value are of primary importance. Other physical properties to be investigated are those of specific gravity and absorption. The latter property is of especial value where frost action is very severe.

Mr. Page then gives particulars of the various tests for determining the hardness, toughness, resistance to wear and cementing value of road stones, and describes and illustrates a number of machines. We return again to the report.

Interpretation of Physical Tests

1. Hardness.—Rocks having a coefficient of wear below 14 are called soft; from 14 to 17 medium, and above 17 hard.

2. Toughness.—The results of a toughness test are interpreted so that the rocks which run below 13 are called low; from 13 to 19 medium, above 19, high.

3. Resistance to Wear.—In interpreting this a per cent. of wear above 5 is called high; from 3.1 to 5, medium; from 2 to 3.1, low, and below 2, very low.

4. Cementing Value.—Cementing values below 10 are called low; 10 to 25, fair; 26 to 75, good; 76 to 100, very good, and above 100, excellent.

The average results of all of the tests conducted on characteristic road building rocks up to January 1, 1912, are given in the following table:

No. of samples.	Name.	Specific Gravity.			Weight-Pounds per Cubic Foot.			Water Absorbed-Pounds per Cubic Foot.		Per cent of Wear.		French Coefficient of Wear.		Hardness.		Toughness		Cementing Value.		Name.
		Max.	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
16	Amphibolite....	3.10	2.70	3.00	193	168	187	1.65	0.04	10.3	1 0	41.7	3.9	19 0	13.5	40	7	235	11	Amphibolite.
63	Andesite........	2.95	1.85	2 65	184	115	165	12.50	0 05	17.4	1.5	26.0	2.3	19.4	5.0	44	5	500+	9	Andesite.
183	Basalt..........	3.05	2.30	2.85	190	143	178	6 40	0.02	16.6	1.3	30.4	2.4	19.3	5.7	40	5	500+	2	Basalt.
52	Chert	3.00	2.00	2.55	184	125	159	11.10	0 25	29.2	2.7	14.9	1.4	19.7	12.7	26	5	500+	2	Chert
9	Conglomerate....	2.65	2.00	2.62	165	156	163	3.71	0 26	12.7	3.5	11.6	3.2	18 4	9.3	10	10	500+	20	Conglomerate.
217	Diabase.........	3 20	2.60	2 96	200	162	185	2.73	0.03	6.3	1.1	36.4	6.4	19.4	12.3	54	4	500+	2	Diabase.
72	Diorite.........	3.35	2.70	2.86	209	168	179	1 03	0.05	12.0	1.6	25.0	3 3	19.4	16.6	38	4	148	5	Diorite.
183	Dolomite	3.00	2.30	2.73	181	143	170	9.49	0 07	18.6	1.2	33.3	2.2	18.8	1.8	27	3	179	9	Dolomite.
6	Eclogite........	3 65	2 95	3.20	228	184	200	0.28	0.10	2.9	1.8	22.7	3.8	18.7	17.4	51	14	130	10	Eclogite.
11	Epidosite.......	3.30	2.70	3.04	206	168	190	1.65	0.22	7.4	2.0	19.6	5.4	19.3	10.7	23	8	83	3	Epidosite.
11	Felsite	2.80	2.50	2.65	175	156	165	3.13	0.02	3.4	1 9	21.5	11.8	....	....	....	....	.....	....	Felsite.
91	Fieldstone......	....	....	....	....	....	..	.....	.. .	10.3	2.1	19.0	3.8	....	....	....	....	15	12	Fieldstone.
42	Gabbro..........	3.65	2.75	2.97	228	172	185	0.97	0.04	5.9	1.3	30.8	6 8	18.8	13 3	23	8	134	6	Gabbro.
152	Gneiss........ ..	3.20	2.60	2.75	200	165	172	1.24	0.02	16 4	1.7	23.0	2.4	19 3	9.0	25	2	110	1	Gneiss.
219	Granite.........	3.00	2.00	2.66	187	122	166	2.77	0.04	24.6	1.1	37.0	1.6	19.6	13.6	33	2	255	2	Granite.
136	Gravel	....	....	....	....	....	....	.....	....	....	....	....	....	....	....	....	....	500+	3	Gravel.
718	Limestone......	2.85	2.00	2.66	178	125	166	13.22	0 02	34.2	1.8	21.7	1 2	19.1	0.0	25	2	500	9	Limestone.
37	Marble.........	2.85	2.65	2.76	178	162	172	2 19	0.10	14.0	2.3	17.5	2.8	17.3	7.1	23	3	85	10	Marble.
9	Marl	...	....	....	....	....	....	.....	...	...	....	....	....	....	....	. .	...	500+	96	Marl.
19	Mixed stone.....	....	....	...	....	....	....	.....	. .	10.3	2.1	19 1	3 9	....	....	...	....	...	....	Mixed stone.
5	Peridotite......	3.55	2.65	2.95	221	165	181	1.02	0.27	5 3	3.0	13.2	7.6	15.0	13 3	12	9	91	25	Peridotite.
90	Quartzite.......	3.15	2.35	2.67	196	147	167	2 95	5 05	7.6	1 6	24.5	5 3	19 7	15.3	30	5	45	0	Quartzite.
42	Rhyolithe.......	2.90	2.05	2.56	181	128	160	7.15	0.03	9.7	1.7	23 0	4.1	19.7	15.3	42	6	500+	9	Rhyolite.
340	Sandstone	3.25	2.00	2.61	203	125	163	11.60	0.02	41.7	1.0	40.8	1.0	19.5	0.0	60	2	500+	1	Sandstone.
136	Schist..........	3 20	2.65	2.94	200	165	183	1.35	0.06	23.3	1.3	31.7	1.7	19.0	0.9	44	3	232	5	Schist.
9	Shale...........	2.70	2.50	2.65	168	156	165	4 84	0.50	16.2	3.2	12.6	2.5	17 7	13.9	12	3	367	28	Shale.
55	Slag	3.90	2 00	2.97	243	125	185	4.40	0.04	13 5	2.5	15.7	3 0	18.3	10.7	21	2	500+	1	Slag.
59	Slate......	3.35	2.60	2.78	209	162	173	2.10	0.05	12.4	1.6	24.4	3.2	19.7	1 1	56	1	500+	1	Slate.
27	Syenite.........	3.05	2.15	2.65	190	134	165	4.21	0.08	14.4	1.6	25 6	2 8	19 2	17.3	34	8	375	10	Syenite.

Maximum and minimum results on rock samples corrected to January 1, 1912.

		Hardness	Toughness	Cementing value
	Limestone	14.4 (517)	8 (524)	54 (560)
	Sandstone	15.0 (237)	12 (242)	62 (257)
	Granite	18.5 (131)	12 (131)	18 (138)
Trap	Andesite	17.1 (54)	18 (54)	196 (58)
	Basalt	17.3 (150)	18 (148)	108 (161)
	Diabase	17.7 (134)	20 (132)	101 (138)
	Diorite	18.2 (40)	16 (45)	28 (43)
	Gabbro	17.8 (26)	15 (26)	44 (29)

		Per cent of Wear	French Coefficient
	Limestone	5.2 (597)	7.7 (597)
	Sandstone	5.7 (232)	7.0 (232)
	Granite	4.5 (166)	8.9 (166)
Trap	Andesite	3.8 (56)	10.5 (56)
	Basalt	2.9 (153)	13.8 (153)
	Diabase	2.7 (126)	14.8 (126)
	Diorite	3.3 (44)	12.1 (44)
	Gabbro	3.0 (25)	13.3 (25)

Note: Numbers in parenthesis indicate number of test averaged.

Considering the question of practical tests in road building materials (says Mr. Page in conclusion), it must be acknowledge that these are extremely difficult to conduct in such a way as to obtain results of very definite value. Even though observations be made on roads built of material, the physical tests of which are on record, these observations because of the varying conditions of traffic and climatic conditions with different amounts of rainfall and different velocities of wind make them almost impossible of comparison with similar kinds of observations taken on another road. Much valuable information, however, has been obtained by a general observation from year to year of roads constructed of different types of materials. In this way the method of interpreting the physical qualities obtained in the laboratory has been devised and it is believed that, although it is impossible to give rocks a numerical grading of excellence from the results of the physical tests, a very accurate idea of the suitability of the rock for the purpose intended may be obtained by considering the tests in conjunction with the probable character of the traffic that the proposed road is to receive, the quantity of that traffic, and the climatic conditions.

Road Administration

By W. A. McLean, Chief Engineer of Highways for Ontario.

Road-building for a nation is, proportionate to each country's size and population, a great public work. The repair, maintenance and improvement of roads is not an ephemeral service, but extends over the lifetime of the nation. The expenditure is constant, in a term of years is exceedingly large, the opportunity for waste is startling, and for economy is an equivalent. This work and service is a business enterprise based on the possible development of a country's varied resources, and with these qualities should be governed by the best principles of business organization.

Efficient system and organization form the key to highway improvement. If laws, and their administration are properly arranged, all details will be taken care of. If the system is well designed, ratepayers and citizens will have at their service a powerful machine, perfect in all its parts, that will produce finished highways, durably built, adapted to the service they are to perform, well maintained, and at a minimum cost.

System implies an effective means of procuring necessary funds, a fair and just method of distributing the cost, a general management based on good business principles, the application of engineering skill to design, and construction carried on with the best utilization of power and labour.

Road administration, the apportionment of responsibility for construction and maintenance, the functions of central authorities and local authorities, the division of areas of mileage, staff arrangement and inspection are details which should be considered in their relationship to recognized rules of efficiency.

The creation of a thoroughly efficient system of highway construction and maintenance, is a task which, in Canada, and the Canadian provinces, is being actively considered and dealt with. While some satisfactory progress has been made, measures to the present time have been those of the formative stage. Evolution rather than revolution has been the history of legislation in Canada, and highway systems and measures are following the general rule. In England, Germany and other countries of Europe, public opinion is well informed in the matter of roads, and excessive cost or inferior service are quickly recognized. In Canada and the newer countries, road requirements have outgrown organization and public knowledge in this regard, with the result that road construction and improvement is a fertile field for unfortunate conditions of cost and management.

Road-building is now, or has been, a local function in Canada as in the majority of countries, but there is an evident tendency toward centralization of administration. A portion of the problem before us thus largely resolves itself into the question:—Does such centralization, wholly or in part, produce more efficient organization? Does centralized authority through a process of selection and higher renumeration, secure leadership and personality of a more influential and outstanding type, through which, order and discipline, standards, public confidence, expert service, and other features of good business organization are most readily focused and applied?

Special Road Conditions

In regarding road administration as a business unit, certain factors at once become apparent.

Conditions are not the same in all countries,—such conditions as area, traffic, taxation, governmental authorities, constitutional limitations, local divisions, and national customs—so that, while the principles of organization are universal, yet varying circumstances must make the answer to our problem an individual one for each nation.

In Canada and the United States, the pressing need is to build roads and afterwards to create a system of maintenance. In England, France, Germany and other European countries, the roads are already built, and the system of maintenance is the prominent feature.

Road Classification

Roads admit of classification, so that, while centralization may be beneficient for one class, it may not be so for all. In general three broad classes will exist:—

1. Roads of least travel, those of exceedingly limited and local service, such as may be described as parish or township roads.

2. Roads which are the main arteries of a moderate area, radiating from market towns, which collect the traffic of the district, and which may be termed county roads.

3. Roads which carry traffic between large centers of population, direct routes across a large territory, which may be classified as of state or national importance.

Labour Efficiency

The cost of road-building is created chiefly by the cost of labour. Comparatively little is spent for crude material alone. Grading and draining are almost wholly a matter of labour. Stone in the quarry is of little value—its value grows out of the cost of quarrying, crushing and transportation, and afterwards putting it in place and rolling. Crude asphalt and tar are cheap. The cost grows out of refining and applying to the road. To build roads cheaply and well means a wise direction of labour to which the best principles of military organization, of the organization of great contracting, or mercantile, railway, or industrial concerns should be applied.

A Definite Conception

A board and definite conception should be established. of the work as a whole, and the objects to be reached. A perspective view, a view from a height, is necessary in order that relationships may be understood and effectively ararranged; in order that all details and features may be co-related. A narrow outlook, one which sees only from close range, has a magnified sense of some features, while others are wholly obscured. Details must not be overlooked, but they must be kept in their place, and all parts adjusted so as to serve their proper purpose. The broad ideal so determined, should be made to exercise a proper influence throughout the entire business organization.

A central or national authority is more remote from local or petty issues and affords opportunity to view the country's road question from the higher view point, so that administration is from a broad but definite conception of the service and traffic requirements as a whole.

True Economy With Sound and Convenient Finance

Regarding the nation's system of road organization as a unit, true economy of operation is to be sought. True economy does not seek the least expense of administration alone, not greatest durability and efficient service of roads alone, not minimum cost of roads alone, but rather the most effective combination of all factors, so as to produce maximum returns for a minimum or available expenditure. If state administration will produce better roads, or will reduce the cost of all roads or one class of roads, an added expenditure for a central administration may readily be a measure of true economy.

Certain roads are of more than local service. They serve the requirements of national or even international traffic. The motor vehicle has overcome all former distance limitations, and for one local user of a road there may be hundreds from a distance passing over a main or interurban road daily. Central administration permits the application of national or state funds to the construction and maintenance of such roads, thereby more equitably levying the cost upon those who are benefited. Not only for purposes of just taxation, but in order that certain roads may be maintained to a fit standard for traffic is it essential that state expenditure be made, as the upkeep of certain roads is exceeding the ability of local muncipalities to defray the cost.

Roads of a national character under central authority, can be treated throughout with uniformity, and substantial construction with large expenditure can be made, commensurate with the needs of a great work, whereas under local authorities these qualities are lacking or exist in a less convenient degree.

Leadership

Leadership and personality is a strong factor in good organization. The chief officer of a national or great corporation can exercise a marked influence throughout all minor departments. He is in a position to speak with the best facts at his disposal, and through his position a unity of purpose can be created that will focus all energy available upon the one object and result.

Order and Discipline

Order, "Heaven's first law," must be created, if maximum efficiency is to be attained. Each individual in the service should be so guided that he will move in his proper place. Subordinate divisions should operate in unison with one another. There should be no friction or discord in their movement. Like a great machine, each part, and each aggregation of parts, should serve its purpose under a control and discipline that is beneficent, but firm. Energy should not be wasted by useless motions and methods, but like the railway system of despatching, there should be provision for orderly, definite, and well-adjusted movement of every kind.

Without combined effort to reach a well defined end, chaos, not order, is more apt to exist. With each local municipality exercising sole jurisdiction over all the roads within its area, unity of purpose, and uniformity of results are impossible.

Intelligence and Skill

Intelligence and skill, born of instruction and experience, should be created. Each officer, every labourer in the service should be led to exert his best individual effort with his mind as well as his body. Subordinate divisions should, through mutual understanding, be led to co-operate in harmony for the benefit of the work as a whole. It is human nature to dislike and to shirk the study we do not understand or the difficulty of a new task in which we are unaccumtomed and awkward. When the subject is familiar and is understood we read intelligently and with pleasure. When the art is mastered we practice it with ease and pride, and the sense of labour vanishes. The larger organization is capable of imparting better instruction, of affording more permanent employment, and of offering better rewards for ability and long service than is a small local corporation. From this source central responsibility derives an advantage, creating a skilled body of workmen, inspectors and officers to an extent that is impossible with a minor body.

Standard Practice

Standard practice should be established. Standard designs of roads and bridges, standards of materials, of machinery, implements and methods should be created. Uniformity is not merely pleasing, but is conducive to economy, good workmanship, and best results. It reduces the difficulty of supervision, it simplifies organization, and is essential to order and discipline. Without standards, wisely flexible but nevertheless clearly existent and unavoidable, a degree of chaos must exist.

Such standards, extended over a wide area, create a more depenable staff of officers, and a larger body of workmen to draw upon. A central authority, by long experience, careful study and selection is able to establish and create the best standards obtainable.

Expert Advice

Expert advice must be secured, based on scientific study, observation and investigation. With many problems of administration, construction and maintenance still to solve, with constantly changing conditions, there is every need that technical progress should be given encouragement, and that its application should be immediate and well-placed.

Under central authority investigation can be carried on for a nation, state, or other wide area, without the duplication of many local units, with a greater expenditure and the greater efficiency that should grow from larger salaries, better equipment, and less strict economy, thereby producing the best of expert advice, and providing standards for uniformity in practice. While not necessarily a factor of administration, it is most efficient when closely associated with practical work, but an office of road investigation is a function of national government. In a great area such as Canada or the United States, National may properly be supplemented by State or Provincial investigation.

Records and Cost-Keeping

The system of records and cost-keeping should be accurate, adequate and prompt, and methods of accounting should produce a clear and intelligent statement of expenditure. Cost-keeping is essential to a proper handling of business. A good system of cost-keeping enables one to determine the relative values of materials and methods, and by fixing a standard of production, will indicate the efficiency, or the reverse, of labour, supervision or other feature involved. To be reliable, records and cost data must be accurate, otherwise they may be indefinite or misleading; they should be adequate, covering all operations involved, otherwise their interpretation may be useless; unless they are prompt, they will fail to suggest a remedy at the time the remedy is demanded or when it would be most effective. Unless a clear and intelligent statement of expenditure is given, public distrust and suspicion is created. Central administration with its broader field, is capable of exercising a most beneficial example and influence in this regard.

Public Confidence

Public confidence must be maintained. To this end the cost should be justly distributed among all citizens according to benefit, visible organization should be efficient, and results should be commensurate with honest expenditure. All business organizations seek public good will, and government efficiency is particularly dependent upon the support and co-operation of the people. Responsibility should be definitely placed, and should be responsive to public requirements.

Fixed Responsibility

Divided and uncertain responsibility is wholly at variance with good discipline and orderly operation. To give directness for blame or praise in this regard, those in charge should be answerable to the portion of the public served. The authority in charge of local roads should be answerable to the ratepayers of the locality; those in charge of more important roads serving a wider area, should be responsible to the opinion of the people using such roads; and the authority in charge of roads of state or national value, should be answerable to the people of the state or nation.

Such an arrangement might be reached by installing one central or national authority with complete power and full responsibility for all roads. Or it may be accomplished by giving the parish or township jurisdiction over local roads; the county council jurisdiction over main roads of the country; and if necessary creating a state, provincial or national department for roads serving travel or transportation of the widest or national area.

The writer's observation has led to the opinion that, under widely diffused authority as in England, the local or less important roads are apt to be maintained in an excellent manner, but at the expense of the main roads which are lacking in a desirable continuity of treatment. Under highly centralized authority as in France, the tendency is to bring the main roads to the highest perfection, while the little travelled roads may show less evidence of careful maintenance.

Seeking the reason, it may be safely inferred that under diffused responsibility, local roads receive the careful and constant supervision of good resident engineers or superintendents, who give daily attention to the individual roads at all seasons of the year, to local traffic, drainage, road metal and similar details. Under highly centralized authority, this power to act promptly, and incentive to observe, may be lacking; and in a desire to avoid criticism of the more influential public, the treatment of main roads may be given first place in apportioning expenditure, while the lesser roads are starved.

It becomes apparent that neither widely diffused authority nor highly centralized authority is faultless for all conditions. A wise union offers a solution, thereby utilizing all public opinion, and fixing responsibility to the best advantage. By this means, local responsibility would be confined to roads of local importance, developing local influence as far as possible for the benefit of such roads. County authority would then be utilized in its sphere for roads of greater radius; while national or state power should be focused on roads having through traffic so great that their upkeep is an unfair charge upon local authorities, and from whom uniformity of treatment cannot be expected.

Moving on lines of least resistance, the existing governing bodies should be utilized as far as possible, without creating new boards or corporations. Lines of centralized authority can, the writer submits, in Canada or the United States most rapidly and effectively converge in the state or provincial governments for main roads. England has no intermediate organization between the county council and the national government, as has the United States where each state has its own legislature, or as in Canada where the provinces are between the local and federal administrations.

Resume

A brief resume of the views advanced by the writer leads to the conclusion that centralized administration is in accordance with, and essential to, the best principles of organization, but that its adaptation should be carefully adjusted to special conditions of each country. Such centralization should place subordinate responsibility where it properly belongs—in the body exercising jurisdiction over the area served. To state or national authority properly belongs responsibility for state or national roads, and also branches of investigation, general instruction, and good leadership. Such a policy of state co-operation creates unity of purpose and effort, and produces the ultimate efficiency that commands public confidence, and support.

Improvements in Road Machinery Since Second Congress

By Arthur W. Dean, M. Am. Soc. C. E., Chief Engineer Massachusetts Highway Commission, Boston.

Mr. Dean is of the opinion that the changes and development in machinery used in the construction and maintenance of roads in the United States during the period that has elapsed since the last road congress held in Brussels, are confined almost entirely to improvements tending to make more perfect the types of machinery previously in use, thereby securing greater economy and accomplishing more perfect results in the work performed.

Manufacturers learn by experience the weak points or deficiencies in their apparatus, and if they have a good reputation which they desire to sustain, aim to strengthen the weak points and all new parts to overcome the deficiencies. Contractors desire to reduce costs to the lowest possible figures, and use their minds to invent methods and machines that may assist them in securing such reduction. Road officials, having the same desires as the contractors, but with the additional desire to secure the best results obtainable, and some having also the incentive of personal ambition and even of pecuniary gain for themselves, have given such thought to new and improved methods and machinery that would assist them in securing their desires.

Rollers, tractors and crushers are built to-day exactly as they were three years ago. Some advance has been made, however, in the motive power for these machines, due to the development and improvements in the gasoline engine. Gasoline motor rollers however, have not superseded the steam roller to any great extent. While it may be possible that gasoline motors may become quite universally used, it is improbable that such will occur in the immediate future, as there are many features regarding the steam engine that cannot be readily equalled with the gasoline engine, and furthermore, there has to be overcome the prejudice of machinery users against the gasoline engines, due perhaps to the many examples of what might be termed the fickleness of these engines when used to propel automobiles.

As the construction of mixed bituminous roads becomes more universal, there is an increase in the demand for suitable mechanical driers for drying the aggregate, and mixers for mixing the aggregate with the bitumen. The old method of drying stone gravel or sand, by spreading on sheet iron under which a fire is kept burning, has many times been demonstrated to be unsatisfactory, and it is quite the universal practice at this time to use some form of dryer that will mechanically keep the material in motion and thus prevent one portion from becoming extremely hot and another portion insufficiently warmed.

A form of drier which has become quite generally used is similar to a large concrete mixer, the material to be dried being kept constantly in rotation, and heated and dried by means of a blast of hot air created by means of oil burners, the burners of course much magnified in size and volume.

Improvements have been made also in mixers for incorporating the bituminous material with the dried mineral aggregate. These mixers are an adaptation of the long used standard concrete mixers, and are almost identical with them except that a blast of hot air is constantly forced into the mixer in the same manner as outlined above in the case of the dryers. Several devices for heating bitumen have been evolved, but they are all improvements or enlargements on forms of heaters that have been in use for the purpose for many years. Labour and time-saving devices have been added.

One marked improvement in heating kettles is the addition of a chamber above the reservoir containing the heated material, in which chamber the barrels in which the bituminous material is shipped, are placed, so that the heat that might otherwise be wasted, passes into the chamber and warms the bitumen in the barrels to a sufficient extent so that it will flow into the hot reservoir, thereby keeping up a much more constant supply of hot material than could be kept by the old method, wherein the reservoir was filled and drained intermittently.

Perhaps more attention has been given by road men to oil and tar distributors than to any other form of road machinery, and there have been placed upon the market more than a dozen forms of distributors, each claimed to be unique and of such superiority over any other distributor that it warrants securing patent rights. They all appear however, to be only improvements over old devices, or adaptations of machinery used for other purposes to the distribution of bituminous material.

The writer has carefully observed many machines of all types used in connection with road construction, and has also examined carefully the catalogues, descriptions and claims issued and made by manufacturers, and has concluded that the machinery in use in the United States to-day is substantially identical with that in use three years ago, the new features being principally the increase towards perfection that always continues where there is a desire to secure the best results with proportionate economy.

Qualifications of Engineers and Surveyors in Charge of Roads

By Harold Parker, Vice-President Hassam Paving Company, Worcester, Mass.

As Mr. Parker points out, the present stage of development in the construction of roads, is the result of a long period of evolution, beginning at the time when roads were merely paths in the wilderness, developing gradually with the needs and requirements of society as such needs and requirements indicated or demanded. Such paths were, of course, the outcome of local use, and no scheme or plan was employed either in their location or preservation, except in so far as necessity demanded.

By degrees the continued and increased use of such ways required further attention on the part of the users, and so by slow steps the modern road was reached. It is quite easy to picture man, as he emerged from the primitive state, using step by step, improved methods and more efficient means, to reduce the labour of transporting his food or other supplies from place to place. It became, therefore, a logical consequence that those persons were placed in charge of the work of preparing new transportation conveniences where such became necessary by reason of the increasing population of the developing needs of growing civilization who were best fitted therefor.

The care of the ways already in use became of greater importance, and the need of men whose skill in such work was more and more felt. These men must have been of course, in the beginning, without knowledge or experience but their knowledge increased and their experiences and trials and experiments led to gradual improvement and the semblance of a standard of excellence. This process of evolution in the building and maintaining of roads, of necessity developed the actual builders themselves, and the crude hands that shaped the first rude highways gradually became skilful engineers, who possessed all the accomplishments that enabled them to produce the most satisfactory results.

All civilized countries are at present and have been for generations trying to solve the problem of constructing and taking care of roads, both from an administrative and a constructive point of view. An examination of the method of highway administration and construction in different countries, indicates the value of these main considerations, the relation one to another may be varied, but the seven points may be considered as fundamental.

First.—The concentration or centralization of road information.

Second.—The classification of roads in accordance with their importance.

Third.—The distribution of finances, including cost of maintenance.

Fourth.—The character of those having the road in charge.

Fifth.—The means of educating road engineers.

Sixth.—Organization of skilled men.

Seventh.—The process of acquiring land.

It is apparent, from observation of the methods employed in almost all civilized foreign countries, that, under these seven heads may be epitomized all the principles of modern road construction and maintenance, and they are valuable as indicating what the evolution of the modern road has led up to in the countries that have been engaged in attempting to scientifically solve the problem, for the greatest length of time.

Under the seven heads that have been indicated, which comprise all the features connected with roads, "The character of those having the road in charge," is fourth. This is, of course, upon the assumption that all the other features are present; for it would be plainly absurd to proceed to the construction even with the first three problems satisfactorily solved, without having the trained men to devise and execute. Therefore in one sense the character and requirements of the men in charge is of the first and not the fourth importance. What the qualifications of these men are, is the subject under consideration.

There appears to be no question that the engineers in charge should be, first, graduates of technical schools or with field training and experience sufficient to give them a thorough knowledge of principles of general engineering practice. This can be obtained in the field, but in view of the fact that a man who has obtained his education in this way has been ordinarily confined to particular lines of work and that therefore his knowledge is so limited that outside of such experiences he knows nothing except by analogy, his education in consequence is not complete, and in so far as it is incomplete he lacks in efficiency. Having therefore acquired, either by school training or by sufficient actual experience and study, a technical education on general principles, it is desirable, if not necessary, that he should specialize and devote a year or more to the practice of highway engineering as such, under teachers fitted to instruct. This implies in addition to the civil engineers knowledge of location and construction, the chemist's knowledge of chemical and physical analyses and the method of testing materials used in modern road construction. Having thus prepared himself he is ready to take up the actual construction of roads and their maintenance, but not without the leadership or direction of those whose actual experience have taught them wisdom.

It is the unqualified opinion of the writer of this paper, based upon many years of observation, that a long period of actual practice on the work is requisite to entirely equip a man as an ideal road designer and builder and to qualify him to maintain them after completion. It is true, of course, that we have many good road builders who have not graduated from technical schools and whose experience has been limited to a narrow line of work; these are, however, exceptional, and their complete usefulness would undoubtedly be curtailed by their limited education. It is true, also, that with the same education, one man will far surpass his fellow in one or all the qualifications that make up the ideal,—this is, however, inevitable, for the personal equation is as manifest here as everywhere else. Instances are by no means uncommon where men of the most thorough technical training and many years of field work are wholly incompetent to design plans for construction or maintenance. No training would qualify such individuals. On the other hand it is not infrequent that instances of men well fitted to build and maintain the most important highways may be found who have had no academic education whatever.

Theoretically, therefore, the highway engineer should not only be able to locate or re-locate a given road and to design and construct the necessary bridges and culverts and make all necessary calculations, but he should have such scientific knowledge as would enable him to maintain it in the most economical manner after it is built. This means a thorough technical training and years of experience. Until these facts are absorbed and acted on, the public will suffer to the same extent that they are neglected.

The qualifications of the engineers in charge of the construction of roads must be such as to fit them by education and experience to secure such results as have been already intimated or stated in this paper and should be graded in the actual operation after having secured the technical training in accordance with their experience and personal qualities.

The organization on work of any extended character, should consist of the chief engineer, resident or division engineers, according to the area of the territory covered, and such subordinate inspectors of construction and maintenance as the amount of work requires, each grade being filled by men who have shown by trial to be fitted for the official duties that may be assigned to them, and all, of course, reporting ultimately to the chief engineer and under his direction.

In a general way it may be said that preliminary or locating engineers, that is, those who make surveys for the location or re-location of proposed roads or old ones respectively, may with greater propriety be classified as surveyors who should be confined particularly to this class of work, as this class of work requires the service of men whose work is specialized. Estimates of cost after the surveys have been made by the locating engineers, may properly and preferably be worked up under the supervision of the division or resident engineers, who, from the nature of things have intimate knowledge of the cost of labor and material in any given locality within their jurisdiction. Trained men in any of these capacities will produce the most accurate and reliable results, and probably under a system briefly described above, will accomplish in the most economical manner the results that are being sought the world over. It is, however, necessary that interested motives or political influence in the organization of such a force must be absolutely eliminated.

If it were possible to have in all countries an organized bureau under the governmental direction such as the Department of Roads and Bridges in France, it is probable that the best results would follow, but in most countries such a plan cannot be carried out for the reason that the territory to be treated as a whole is too large and too complicated to be embodied under one head.

It is undeniably a fact that in the public service smaller salaries are paid than where private or corporate interests are involved: the plea of patriotism and love of country is given as the reason why a man should give his life and best efforts to public service with small remuneration. This view is, of course, unwarranted. A man is entitled to the full value of his services, whether given to public or private interests. Governments are parsimonious in questions relating to salaries, and as a result their best servants are constantly taken away to serve individauls or corporations who are willing and anxious to pay full value for the work they do. The public therefore is the loser, for it is undeniable that, in their astuteness, the great corporations pay no more than the service rendered is worth. From these considerations it is sufficiently evident that, ultimately the government will have to pay in salaries the market value of their servants, or lose them.

Removing Sponge from Pipes

An interesting announcement was recently made at a meeting of the Cardiff Waterworks Committee, when the waterworks engineer, Mr. C. H. Priestly, said that he, in conjunction with Professor Parker, had succeeded in overcoming the difficulty experienced with regard to the growth of sponge in the pipes in the filtering area at the Llanishen Reservoir. The agent employed was a solution of common salt, and so successful had it proved that up to the present week there was no sign of the reappearance of the growth. Mr. Priestly added that Professor Parker himself was so impressed with the result of the experiment that he proposed writing a paper on it for the Geological Society, as a record might prove of assistance to other waterworks encountering similar trouble.—The Engineer.

The channel tunnel idea is once again attracting attention both in England and France. In France the channel tunnel has always been looked upon with approval. The British Chamber of Commerce in Paris has decided to support a resolution in favor of the construction of the tunnel which is to be submitted in September at a conference of associated Chambers of Commerce at Antwerp. The matter is to be discussed in the British Parliament, the Premier has been asked to receive a deputation on the subject. From the engineering point of view there are no serious difficulties in the way of carrying on to completion, the abandoned works.

A wash for concrete consisting of a dilute solution of hydrochloric acid, one part of commercial 30 per cent. acid to five parts of water, has been found effective in cleaning the stains from the lock walls of the Panama Canal, according to the "Canal Record." The surface of the concrete was brushed over with the solution, and afterward was rinsed with clear water. The application and subsequent rinsing freed the concrete of all discoloration. The process has proved satisfactory.

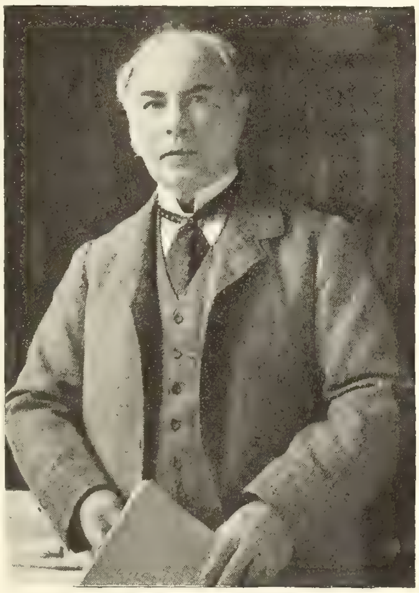
The Life-Work of Sir Robert Perks, Bart.

Distinguished British Engineer of International Reputation—His Connection with Canada in the Contemplated Georgian Bay Canal

(Staff Article)

SIR Robert Perks, Baronet, engineer and contractor, was born at Kensington, London, Eng., in 1849. His father was a well-known Methodist preacher and became the President of that powerful nonconformist church. Throughout his life Sir Robert has been a prominent leader of British nonconformity and when in the House of Commons was the Chairman of the "Nonconformist Two Hundred." Politically, Sir Robert Perks is an Imperialist, a Free Trader and an Individualist. He represented North Lincolnshire in the British House of Commons from 1892 to 1910, but then retired temporarily from political life in order to give his undivided attention to the large public works with which he is associated.

He was educated at King's College, London, where so many English engineers have been trained for the engineering profession, but entered the law in 1878 and soon became a prominent Corporation lawyer. On the nomination of Sir John Hawkshaw and Sir John Fowler, two eminent engineers, he was elected an Associate Member of the Institute of Civil Engineers. In 1879, when only thirty years of age, he was appointed legal adviser of the underground railways of London. In later life he became Chairman of the Metropolitan District Railway, in which capacity he had to direct the conversion of that densely-crowded London railway from steam to electricity. He, together with Messrs. Speyer & Company, of London and New York, and also Mr. Yerkes, of Chicago, was mainly responsible for the enormous system of electric railways in London which now plays such an important part in the transit arrangements of the great metropolis.



Sir Robert Perks

In the year 1880, Sir Robert Perks formed a close business alliance with the late Mr. T. A. Walker, of Westminster, and subsequently with Mr. C. H. Walker, a connection which lasted for thirty years. During that period the firm built many great works in England and abroad. Among these were the Inner Circle London Railway, the Barry docks and railways, South Wales, the Manchester ship canal, and the gigantic port works at Buenos Ayres, which are the largest, the finest and the most remunerative docks on the American continent. His firm also constructed the Transandine railway and tunnel through the Andes, connecting the capitals of Chili and Argentina. Later on they were entrusted by the Brazilian Government with the construction of the magnificent quay wall around Rio Janeiro Bay and the vast land reclamation. This work, costing about $25,000,000, was entrusted to Sir Robert Perks and his partner, Mr. Walker, without competition. He is now interested with the Walker firm in the extension of the Port at Buenos Ayres, a work which is costing some $35,000,000, and which his firm secured in competition with the leading contractors of Europe and America. Among other important works built by Mr. Walker and Sir Robert Perks were the Preston docks in England, the Alexandria docks in Egypt, and the Bahia Blanca port works, and the Southern Pacific Railway Docks, Buenos Ayres.

In 1910, Sir Robert Perks retired from his old firm at Westminster and in conjunction with Messrs. MacArthur Bros., of New York, formed the firm of MacArthur Perks & Company, Limited. This firm are now building extensive docks at Havana and are dredging out Havana Harbour. They are also building for the Southern Pacific Railway Company an important railway along the Pacific coast of Oregon, from Portland, through Eugene, to Coos Bay, a beautiful harbour in Oregon which is destined, so its friends think, to play an important part in the commercial future of the Pacific coast. This line will probably form part of a through low level route from Portland, Oregon, to San Francisco.

So far as Canada is concerned, the great work to which Sir Robert Perks is giving his sole attention is the much-talked of waterway from the St. Lawrence to Georgian Bay by way of the Ottawa, the Mattawa and the French rivers. This is an enterprise of great magnitude. The main features of this vast undertaking are well known; it involves a canal—22 ft. deep, wide enough to allow ocean-going vessels to pass in perfect safety, and 440 miles long, with 24 great locks—from the east end of Montreal Island, by way of the Back River and the Lake of Two Mountains, to Ottawa, and thence to North Bay, across Lake Nipissing and down the French River to Georgian Bay. The promoters of this enterprise estimate that they will carry at least 16,000,000 tons at a cost of 50 cents a ton, and wheat at 1½ cents a bushel. They assert that they will be able to put wheat into the elevators or steamers at Montreal at a price with which no other route can possibly compete. There is no doubt, in the mind of Sir Robert Perks, that if these results are achieved, Montreal will become the greatest grain shipping port on the American continent. Ottawa also will have all the advantages of direct access for ocean-going steamers. The United States ports of Chicago, Milwaukee and Duluth, as well as Fort William and Port Arthur, will have direct access for large ocean-going steamers to the ports of Europe. Canadian coal and steel from Nova Scotia will contribute largely to the trade of the canal. The charter for building and operating the canal is in the hands of a British company who have spent very large sums upon the vast amount of preliminary engineering and other work incidental to such a gigantic enterprise. Steps are likely to be taken to reconstitute the directorate of the Canal company and revest the control of this enterprise in Canadian hands. The history and progress of the Canadian Pacific Railway, compared with that of the Grand Trunk Railway, is sufficient to show the advantage of controlling a Canadian enterprise from Canada and not from London, although the capital for so great an enterprise must be found in England. Sir Wilfrid Laurier's Government appointed an Engineering Commission to report upon the engineering details and cost of this enterprise. This enquiry lasted four years and cost the Canadian Government $850,000. Mr. Borden recently appointed a Commission to report upon the commercial necessitay and the financial prospects of such a work. Upwards of one million horse power of electricity will be generated in the canal. With three essential advantages, namely, the cheapest form of transit, the cheapest for of power, and abundant supplies of raw material, it is not unreasonable, we are told, to believe that the route of this great waterway will be peopled in years to come with a great industrial population and busy factories.

Sir Robert Perks has frequently said that the two greatest public works now remaining to be done are the Channel tunnel, between England and France, which will carry passengers from London to Paris in five hours without change, and the Georgian Bay canal, which, "for the first time," to quote Sir Robert, "will take the ocean-going steamers of the world into the vast inland seas of Canada and set free the steamers, which are now ice-bound in the Great Lakes for five months of the year, to get out and trade in the winter in temperate seas."

British Firms Looking to the Canadian Trade

THE CANADIAN "BITUMASTIC" ENAMELS COMPANY

This firm are the patentees and manufacturers of the well known "Bitumastic" Specialities for the protection and preservation of iron and steel structures (see advertisement on page 42).

It is obvious that had engineers and architects in the past always adopted the simple means of preservation afforded by such materials, much of the reconstructing and repair work now in hand would have been unnecessary. It is not pleasing to see cable-troughs alongside the underground railways of London and ironwork in numerous constructions corroding because they lack the requisite treatment. Prevention is invariably better than cure, and when it is considered that the expense of replacement is sometimes out of all proportion to the actual worth of the parts involved, it is to be regretted that more foresight has not been used. For example, it should be easier to protect the link-pins of a suspension bridge from corrosion than to renew them. The manufacturers of the "Bitumastic" solution, claim for their product that it is a first-class anti-corrosive with a large covering capacity; further, that it dries quickly, and does not crack or peel off, and that it is not affected by chemical fumes, hot smoke, salt or fresh water. It is used by railway companies, municipal authorities, government offices, collieries, etc., for the protection of great bridges, girders, iron tanks, pipes, viaducts, water carts, concrete roofs and tanks, manhole covers, corrugated roofs and buildings, sewage and sludge tanks, gasholders, smoke stacks, iron staircases, and numerous other concrete and iron structures.

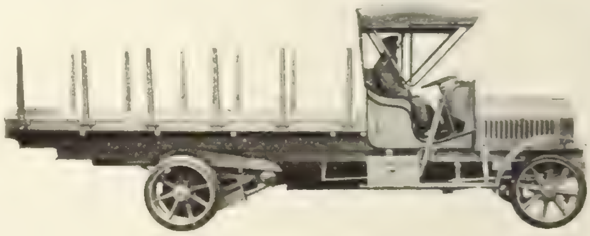
Unlike their "Bitumastic" Solution, which is supplied in a liquid form ready for application, cold, "Bitumastic" Enamel is applied in a hot state by the company's workmen to the iron, steel or concrete surfaces (after these surfaces have received a primary coat of the "Bitumastic" Solution) hardening immediately it is put on. Thus applied, it forms a permanent coating, with a hard, bright surface.

"Bituros" is a specially prepared composition introduced by the same firm for iron and steel fresh water tanks. Being of an elastic and strongly adhesive nature, it does not crack or peel off, nor does it impart to the water any disagreeable flavor or discoloration.

The Canadian "Bitumastic" Enamels Company, of 720 Traders Bank Building, Toronto, Ont., are represented throughout the various parts of Canada as follows: Maritime Provinces, The General Contractors Supply Company, Halifax, Nova Scotia; province of Quebec, H. H. Hebron & Company, St. Nicholas Buildings, Montreal; province of Manitoba, Grose & Walker, Winnipeg; British Columbia, N. Thompson & Company, Limited, 847-63 Beatty Street, Vancouver.

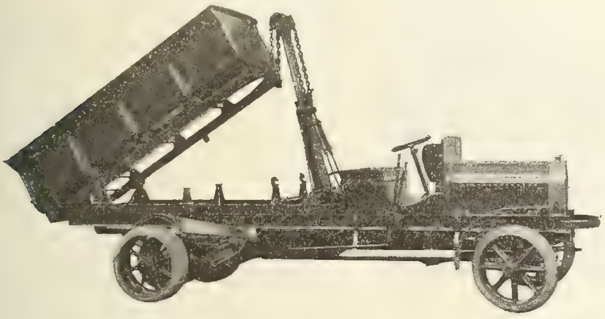
ALBION MOTOR TRUCKS

The Albion Motor Car Company, Limited, Glasgow, Scotland, takes a place among the pioneer motor truck builders. For thirteen years they have been putting their product on the market and are to-day one of the largest, if not the largest, motor truck builders in the Empire. The Albion Motor Car Company of Canada was formed to handle the goods of the Scotch company in Canada. They have fully equipped service stations at Montreal, Toronto, Ottawa and Vancouver, and it is the intention in the immediate future to build a Canadian factory for assembling the parts manufactured in Scotland.


Five ton Albion-Chassis.

In describing their output the company lay stress upon several features; that the Monablock engine which they use is sturdy, substantial and as light as is consistent with great strength; that their patent automatic lubricator provides nine pumps which give a positive feed of oil, in quantity exactly suited to the requirements of the cylinders, valves and bearings; that the patent single disc clutch makes it impossible for an inexperienced or careless driver to strain the car, as it eliminates all jerkiness of control; that the spring drive saves wear on the tires by introducing a slight elasticity, which serves to compensate the sudden strain from the car tracks, ruts, rocks or other irregularities of the road.

The kind of tire best adapted to the requirements of any particular sort of vehicle is always an important matter, and in these days of highway improvement is bound to become more and more a consideration. The Albion motor truck is provided with steel road wheels, these being considered by the makers more serviceable for use in Canada than wooden wheels. For the sake of economy they are provided with tires of unusually large capacity. The company claims that the automatic governor with which the car is fitted prevents the waste of gasoline and automatically regulates the speed and is hence a device of considerable economy. The long easy spring used in building the truck is intended to give comfort to the driver, safety to the load and to lengthen the life of a car. The British preferential tariff of 12 per cent. enables the makers to quote their trucks at attractive prices.



Four-and-one-half ton tipping wagon.

The Canadian company has already placed 75 of these motor trucks in commission in Canada, some 15 of which are in use in Montreal. Among the users may be noted the Canadian Pacific Railway, the Phoenix Bridge and Iron Company, Limited, the Ottawa Car Company and the Dominion Textile Company, Limited.

GENT & COMPANY LIMITED

Messrs. Gent & Company, Limited, Faraday Works, Leicester, Eng., whose advertisement appears on page 38 are one of the oldest established firms manufacturing electrical apparatus in England. The firm was established in 1865, when even the modest electric trembling bell was a novelty. Since that time they have progressed steadily and perseveringly, building up a reputation for reliability of manufacture. Today they stand among the important manufacturers of two ranges of apparatus of special interest to the municipal engineers of our rapidly growing community.

These two lines of manufacture are electric impulse clocks and water level and sewage recorders. There can be no doubt that the electrically driven clock will come, as time advances, more and more into use, especially for large municipal or turret clocks and for church towers.

Among the advantages claimed by this firm for their electrically actuated clock is the absence of weights, the small space taken by the movement and the fact that no winding is required. They further claim that the largest electrically driven clock in the world is to be found in the tower of the Royal Liver Building, Liverpool, and that it is marked by reliability and correctness. This massive time piece with its four 25 ft. dials was constructed and erected by Gent & Company, Limited.

To municipal engineers contemplating the construction of reservoirs for water supplies or who are building sewage disposal plants, the products of this company should be of interest. Their water level indicators and recorders have come into quite common use. These instruments show locally or at a distance the level of the water in the reservoir, even though the latter may be many miles from the engine room or pumping station. In sewage disposal plants the outfall may be measured in the same way, though the record is usually required locally so that this type of apparatus is purely mechanical.

Messrs. Gent & Company, Limited, claim for their recorder that it will work reliably in the most exposed positions and indicate on a regular and even scale the quantity of liquid passing over a sill or through a notch.

SEWAGE DISPOSAL EQUIPMENT

Ham, Baker & Company, Limited, Municipal Engineering Works, Langley Green, Birmingham, and 13 Grosvenor Road, Westminster, London, are a well known firm of English manufacturers of equipment for sewage disposal. This firm has recently completed the installation at Dalmarnock of large disposal works for the city of Glasgow, Scotland. The plant consists of four of their patent electrically driven, travelling, sewage distributors, covering a total area of one and one-half acres and disposing of a daily flow of 4,000,000 gallons.

The following are some of the special features emphasized by the company concerning the equipment which they manufacture:—

1.—The dispersal of aerial nuisances and the dissemination of disease germs are inhibited.

2.—The heat of the sewage is conserved and the effects of low temperatures minimized.

3.—The distribution is rendered more uniform, and at the same time capable of a wider range of variation than in the usual form of dirtributing apparatus.

4.—The rate of travel is constant under all conditions.

5.—The quantity of sewage discharged is uniform.

6.—The effluent resulting is sufficiently purified to be discharged into any river without fear of pollution.

7.—The solidity of construction and the engine finish of the distributor.

Messrs. Ham, Baker & Company have a large institution in the vicinity of Birmingham, consisting of well equipped foundries, machine and erecting shops where they produce all kinds of machinery for water supply, water works, sewerage plants, sewage disposal plants, as well as sluice gates, gate valves up to 60 inches in diameter and penstocks of all sizes up to 12 feet.

That their goods have become widely and favorably known is attested by the fact that they have now under construction sewage disposal equipment for Auckland, New Zealand; Allahabad, India, and Cairo, Egypt. They also have in hand street hydrants for the Metropolitan Water Board, London, Eng., and orders for the British Admiralty and H. M. War Department, as well as gate valves and fittings for a water works system under construction in the East, ordered by the Crown Agents for the colonies.

To irrigate the valley of the Guadalquiver, in Spain, a company has built a dam at a cost of $180,000, and is now planning the construction of a canal. About 24,700 acres will be irrigated. The total length of the canal system, which will cost about $720,000, is estimated at 25 miles.

MIRRLEES-DIESEL OIL ENGINE

The Mirrlees-Diesel oil engine is manufactured by Messrs. Mirrlees, Bickerton & Day, Limited, at their plant at Hazel Grove near Stockport, Eng. The firm known as the Mirrlees Watson Company, Limited, of Glasgow, claim the distinction of being one of the first to recognize the possibilities of the Diesel engine and the first to undertake its manufacture in Great Britain. In designing their engine, the company aimed to take the best features of the Diesel engine as produced on the continent and to combine with these, patent improvements of their own and British solidity and sound construction.

Works at Hazel Grove near Stockport.

This firm gives an interesting description of the manner in which their design was developed for the market. The Mirrlees Watson Company, Limited, spent some years in purely experimental work, during which time, step by step, the difficulties were overcome. Several engines were then installed in their own plant and made to give regular service for two years, under conditions such as would prove trying to any engine. Having satisfied themselves as to the efficiency of their product, a new company was organized to handle this engine. Equipped with all the patterns, tools and drawings, and the members of the staff experienced in the manufacture of Diesel engines, the new company, Mirrlees, Bickerton & Day, Limited, commenced the manufacture of the new design. The enterprise has met with success.

The Mirrlees-Diesel engines are all of the vertical type, and the valves, which are mechanically operated, are arranged in the cylinder covers. Each valve has a removable seat. This is an important improvement, according to the company, as it enables the engine attendant to grind in the spare valves at his leisure, instead of having to do this while the engine is stopped. Then, when a valve on the engine requires attention, all he has to do is to simply pull out the valve and seat and replace them by the spare valve and seat.

The engine is single-acting and operates upon the well-known 4-stroke cycle, one stroke in every four being a power stroke. The cycle is as follows:—

1. On the first down-stroke of the piston, air is drawn direct from the atmosphere into the cylinder, air only, not a mixture of air and gas or oil vapour, is drawn into the cylinder.

2. On the first up-stroke this air is compressed; this compression causes the temperature of the air to rise sufficiently to ignite fuel sprayed into it.

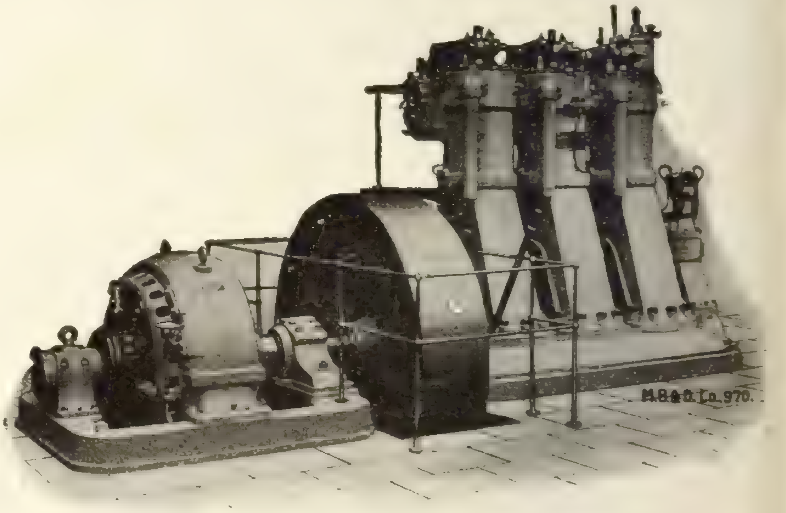
3. At the end of the compression stroke, and during the first period of the succeeding down stroke, fuel oil is blown into the cylinder by compressed air; the oil is sent into the cylinder in a finely divided spray, and is not injected suddenly, but over a measurable period of time, thus avoiding any rise of pressure after the completion of the compression stroke. The amount of oil thus delivered to the cylinder is controlled by the governor so as to suit the variations of load.

4. The next up-stroke is the exhaust stroke, during which the products of combustion are expelled to the atmosphere.

From the foregoing description it will be seen that there is no explosion or sudden rise of pressure in the working cylinder, hence greater smoothness in running and absence of concussion; also that as air only is compressed, there is no possibility of premature ignitions. Further, as the oil is ignited by the heat produced by the compression of the air, no sparking or ignition devices are required. It will also be noted that no carburetter or vaporiser is required.

The compressed air required for blowing the fuel into the cylinder, also for starting the engine, is supplied by a two-stage air pump which forms part of the engine, being direct-driven from a crank formed at one end of the crank shaft. A feature of the compressor noted by the makers is a patented device for reducing the consumption of lubricating oil.

For their Mirrlees-Diesel oil engines the company claims a number of quite important features. That the engine has a high thermal efficiency and that while any oil may be used, a cheap oil will answer every requirement; that the engine starts quickly, taking its full load within one or two minutes. That the absence of a sparking device, carburetter or vaporizer removes many difficulties. That the exhaust is free from nuisance and that the use of oil for fuel removes largely the expense of carting fuel and ashes. And furthermore, that the engine is suitable for varying loads and may be installed in small space.



150 H.P. English crude oil engine.

The Boving Company of Canada, 164 Bay street, Toronto, are the Canadian agents for the Mirrlees-Diesel oil engines.

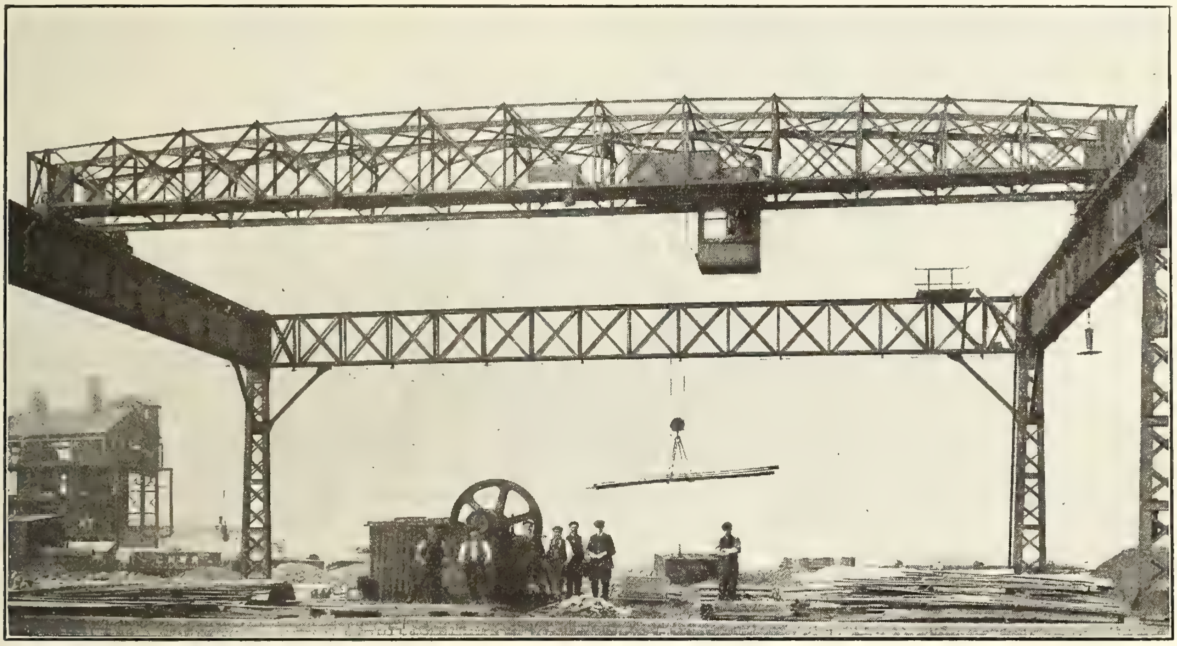
ROYCE, LIMITED

Royce, Limited, Trafford Park, Manchester, Eng., are the manufacturers of electrical cranes which have come into quite general use. Orders have been placed with them by the British Admiralty, War Office and India Office. Among the other users may be noted the railway companies in Canada, Japan and South America. The Hydro-electric Power Commission of Ontario and the Calcutta Electric Supply Corporation of India are also included in the list. In Valparaiso are to be found two cantilever loading stages with the Royce crane equipment.

The company claim to be pioneers in this field of engineering and describe the development of their electrically driven crane as follows: The first step consisted in dispensing with the flying rope and substituting a shunt wound motor, fixed on the crane and supplied with a current collected from two longitudinal wires running the length of the shaft. By this means the power formerly required to move the flying rope was entirely saved, effecting at the lowest estimate, a saving of from 6 to 7 h.p. They assert that the Goliath crane of 25 tons capacity was the first electrically driven 3-motor crane working in the British Isles. It was constructed for the Great Central Railway Company, who later ordered three of the same design for use in their yards at London, Leicester and Nottingham.

In these days of rush orders and rapid construction, when it is necessary to expedite labor to the greatest possible extent, a fast travelling crane is an important part of the equipment, and Royce, Limited, claim that their crane answers this requirement.

Some of the points which they consider of importance in the electrically driven device which they manufacture, are given below. Where three motors are employed they are almost invariably of the series wound type, that is to say, they will run at a constant speed, with a constant load, but with a lighter load will accelerate in a certain ratio. From this it will be seen that if a full load is lifted at a specific speed, very light loads will be lifted much more quickly. Further, the motors are constructed so as to be enclosed and dust proof, as in the majority of cases they are required to be protected from dust and dirt. Even under the most favorable circumstances crane motors are called upon to operate under very trying conditions, such as frequent starting and stopping, reversing, variations in speed due to changes in load, vibration due to the armature being directly connected to gear wheels, application of the brake too suddenly and lowering the load so quickly as to revolve the armature at an excessive speed. The company claim that the machines which they design and construct are to a large extent free from the difficulties just enumerated. By means of an automatic governor lowering gear which can be adjusted (once and for all) the loads are taken charge of when being lowered and the speed is controlled within reasonable limits.



Yard Crane at Steel Mill of Sir Alfred Hickman, Limited, Bilston, Staffordshire.

In speaking of the details in the construction of their cranes the company state that the frame or body of the crab is built of rolled steel plates pressed and stiffened by means of angle pieces and gussets rivetted together; that the gear is all cut, except in special cases on large cranes, the blanks, being turned on their faces and sides in order to ensure true running; that the bearings are all of swivel type, thus avoiding the excessive wear involved in the use of rigid bearings; that the pinions are of high class carbon steel, in some cases forged solid on the shaft and that the barrel is of cast iron, turned all across its face with two spiral grooves to form a bed for the steel wire rope.

Royce, Limited, claim that they prefer to use a large number of falls of rope because in cranes above medium size, say 10 tons and upwards, having eight falls or more, as there are only two falls on the barrel it follows that the load on this particular part is only a small portion of the whole, and consequently the load to which the gearing is subjected is correspondingly reduced; but a still further advantage arises from the fact that a smaller rope is required which allows of proportionately larger pulleys, thus ensuring the longest possible life to the rope. The crane hook is constructed of wrought steel and is carried by a cross head in the bottom block and between this cross head and the nut of the hook is fixed a gun-metal cage containing a large number of hardened steel balls and two hardened steel plates between which the balls run, thus allowing the heaviest loads to rotate with perfect freedom.

In order to procure what they consider the proper operation of their machine, the motor used for actuating the hoisting and lowering gear is what the company terms their standard slow speed multipolar type, securely fixed in an accessible position on the frame work of the crane. The cross traversing arrangement which forms part of the crab consists of a motor of similar construction to the hoisting motor. together with the necessary gearing for actuating one of the axles. The manufacturers state that they have solved the difficulties incident to longitudinal movement by driving the cross shaft from the centre of the crane span, thus ensuring an equal turning moment at each end, and preventing one end lagging behind the other.

In designing their crane, Royce, Limited, state that they have aimed at a machine that will start, attain full speed, and stop in the shortest space. In order to do this they have introduced a patent slipper drive between the longitudinal motor and cross shaft which enables the crane driver on starting to give full speed current without risking damage to the motor. For stopping he can actually reverse the running of his motor and consequently have at his command a formidable and powerful brake. The girders are constructed so as to ensure rigidity under high travelling speeds and when brought to a standstill quickly. Cradle end carriages are adopted so that in the event of the crane becoming derailed or an axle or wheel breaking, the crane cannot fall more than a very short distance, not sufficient to do any appreciable damage.

The motive power is conveyed from the source of supply by longitudinal wires which must run the length of the gantry or shop and may be fixed in many positions along side the gantry rails or girders or pillars supporting the roof. Collectors take the current from the wires and convey it by cables to the emergency switch fixed in the cage or cabin. From the emergency switch the current is conducted to the controllers by cables, in which are inserted safety fuses. On the 3-motor crane there are three controllers. These are conveniently placed in the cage so that when he is seated, the driver has all three controllers within reach. From one of these controllers the current is led to the longitudinal motor direct and for the hoisting and cross traverse motors, solenoid brake and over-winding safeguard, it is necessary to have bare wires stretched across the crane, usually between and under the top flange of the girders, and to these wires are connected the two remaining controllers. To collect the current from the cross wires a special bracket depends from the under side of the crab on either side, carrying collecting gear consisting of small projecting arms which slide along the wires or small revolving pulleys from which the current is led direct to the cross traverse motor. Before reaching the hoisting motor the current passes through an overwinding safeguard which is so placed that in the event of a hook being run too high, the current is immediately shut off, the hoisting motor stopped and the brake applied.

THOS. PIGGOTT & COMPANY, LIMITED

The development of agriculture, manufactures, railways, gas and water works has rendered the collection and storage of water a matter of great importance. Messrs. Thomas Piggott & Company, Limited, Birmingham, Eng., in anticipation of a demand for storage tanks, designed and patented a pressed steel tank which they thought especially adapted for erection in out-of-the-way places.

While the tank met with favor, it was soon found that the plates were not sufficiently rigid to suit all requirements, consequently the design was improved by the addition of diagonal pressed ribs, which strengthened without increasing the weight or the cost. A later improvement has been made by pressing a further strengthening rib into the plates.

The tanks are composed of the following members:—plates, lugs, stays, gusset plates, bolts, joining material and stay plates.

The plates are in standard 4 x 4-ft units, 5/16-in thick, flanges 3-in. wide, holes 5/8-in. diameter, weighing approximately 2-cwt. There are three kinds of plates, A, B and C; A plates, flanged on all four sides; B plates flanged three sides and bevelled one side; C plates, flanged two sides and bevelled two sides. The A and B plates are used for the bottom and side of the tank, and the C plates for corner plates only. The plates are drilled ready for bolting up and for stay bar lugs or plates. The joints are made with strip lead, 2½ x ⅛ in., laid between the flanges before they are bolted up and caulked tight from the inside of tank. The lugs are malleable iron castings bolted to the bottom and sides of tank, and designed with jaws to receive stay bars, which are secured by bolts at both ends. The stays are made in standard lengths from flat bar 2½ to ⅜ in. and are interchangeable. The short stay is connected from bottom to first flange joint, the long stay to the upper tiers of plates.

The manufacturers claim for their tank simplicity, lightness and strength, and cheapness. The simplicity they assert arises from the fact that all the parts are standard sizes, no skilled labor is required for erection, as the parts are bolted not rivetted. The plates are made of steel and therefore lighter than if made of cast iron. Strength is said to be obtained by pressing the plates solid without welds, and by the use of the diagonal ribs which make the plates rigid for transport and when in place.

Messrs. Thomas Piggott & Company, Limited, intimate that among the orders recently received from Canada is one from Messrs. Beardmore & Company, Acton, Ont., for a tank 28 ft. x 12 ft. x 12 ft., and one from the Canadian Pacific Railway for a tank 12 ft. x 12 ft. x 12 ft. to be used with a water softening plant.

Steel Water Mains

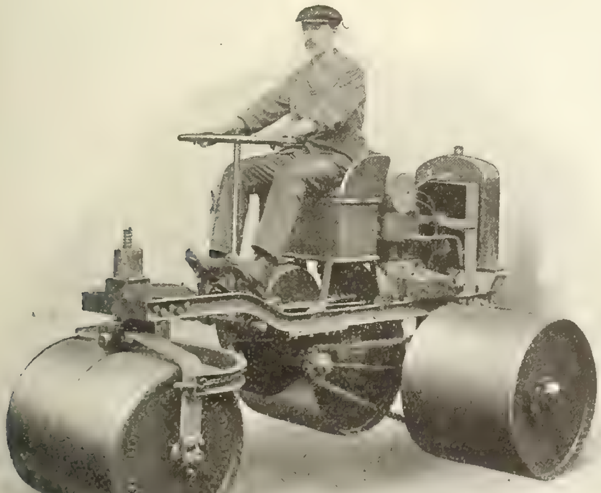
In addition to the tanks mentioned above, this English company are extensive manufacturers of steel pipes supplying any diameter over 12 inches. The pipes are fitted with flange, loose collar or expanded socket joints as required. The Canadian agents for this firm are Heap & Partners (Canada), Limited, 215 Dominion Express Building, Montreal, for the Maritime Provinces; B. & S. H. Thompson & Company, Limited, Montreal, for the province of Quebec; G. H. Tod, 213 Manning Chambers, Toronto, for Ontario; Ruttan & Chipman, Garry Court, Winnipeg, for Manitoba and Saskatchewan; Gorman, Clancy & Grindley, Limited, Calgary and Edmonton, for Alberta and Crow's Nest Pass Territory.

WATER BALLAST MOTOR ROLLER

About eight years ago Messrs. Barford & Perkins, Peterborough, Eng., placed on the market their first motor roller and this roller is still in regular use in the county of Surrey.

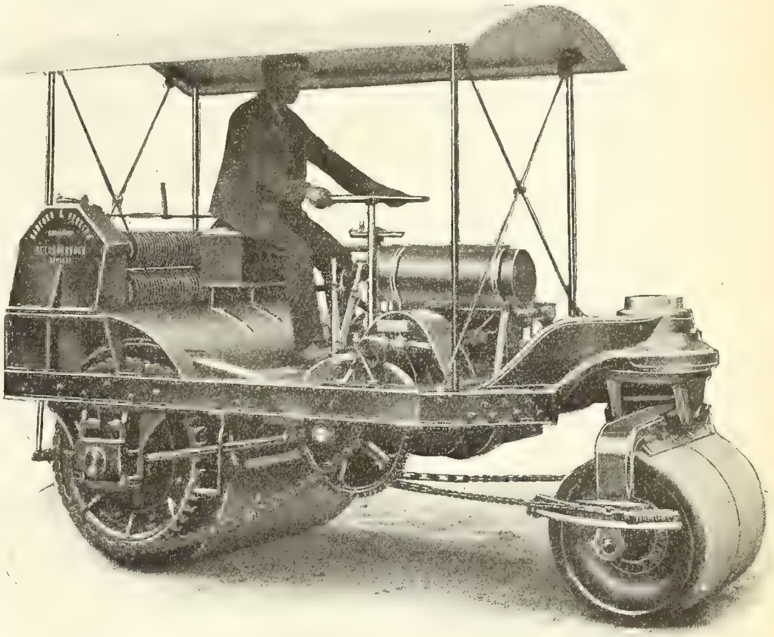
The intervening period has been one of progress on the part of this firm. They have taken an advantage of suggestions from their clients and incorporated them in their later designs. Among these may be noted the spring device now being fitted in the head reducing vibration and providing the advantage of a spring drive. The diameter of the front rollers has also been increased. The machine is a combination of the Barford & Perkins water ballast roller with a motor of the same class as is used in heavy motor vehicles. The hind roller is made of hard cast metal and the smallest size holds about half a ton of water. The channel iron frame is stiffly braced together, the fore part being coupled to the front rollers by a patent spring steering head and bridge. Springs are also used over the hind axle to minimize vibration and strain on the frame. The motor is of British make of heavy design and is especially suitable, according to the makers, for this kind of work and running at moderate speed. The cylinder is water cooled, a sufficient body of water being carried in the circulating tank to enable the cooling to be efficiently done without the aid of a fan or pump. The tank or gilled radiator is placed over the hind roller so that its weight is in a useful position while at the same time its height renders a pump unnecessary, the circulation being automatic. A leather-faced cone clutch on the motor spindle allows the engine to run free for starting. The fuel used is paraffin, and Messrs. Barford & Perkins assert that this independence of coal and water is an important feature.

Two speeds, either forward or backward, are arranged for, usually one mile and three miles an hour, the change being conveniently made from the driver's seat. The reversing is readily accomplished by means of machine cut steel gear wheels combined with a clutch moved by a lever within easy reach of the driver's seat.



Water ballast motor roller for paths, private roads and grass.

Ease in steering and facility of control is provided the driver by a hand wheel placed in front of him, the wheel being connected by means of a chain to the steering head. The bridge spanning the front rollers allows for the oscillation of these rollers when passing over obstructions without affecting the level of the main frame. This, the designers claim, reduces the strain on the frame. The rollers when full vary in weight from 1¾ tons up to 14 tons, according to the design. Among the users of this motor roller may be noted various governments, including the British, German, Russian, Austrian and Italian, and the county councils of Essex, Gloucester, Northumberland, Sutherland and Peterborough, England.



Water ballast motor roller for roads, petrol or paraffin.

BUHRING'S PATENT WATER PURIFYING COMPANY

The absolute importance of pure water cannot be over estimated. With the general advance in the knowledge of sanitation and hygiene, this fact is becoming more and more recognized. Nature provides abundant supplies of water, but owing to the means of supply, countless impurities are collected, such as vegetable and animal substances, drainage, sewage and numerous other kinds of impurities. Municipal authorities in many cases are doing what lies in their power to eliminate these sources of contamination, but even after being purified in the local plant, the water is still liable to receive impurities through standing in pipes or reservoirs of any sort used for collection. Refiltration in any case would be most helpful in obtaining standard purity.

The Buhring's Patent Water Purifying Company is one of the oldest established filter manufacturers. After years of careful study, experiment and labratory test, they claim to produce a filtering medium that collects and retains impurities, organic or inorganic matter, and deodorizes the water.

Among the filters which they manufacture may be noted small gravitation filters, pressure filters, household pressure filters, and large supply gravitation and pressure filters. The small gravitation filter has a body of glass enamelled iron and within is supplied with patent filtering block. This filter may be fitted to any jug, decanter, bottle or reservoir, and is very convenient where space is important, particularly in travelling or at the seaside or in the country. The makers claim for it that it not only filters the water, but reoxygenates and reinvigorates water which has been distilled or boiled.

The pressure filter is manufactured in three sizes and is suitable for domestic, factory or steamship use.

The household pressure filter is a new rapid type made in two patterns, single and double.

The large supply gravitation and pressure filters have been specially designed to meet colonial requirements. They are light in weight and the manufacturers claim that they treat efficiently every kind of fresh water. The body is of strong galvanized iron with valves of bronze. No cocks are used, and there are no moving parts, and hence no wear. A special by-pass pipe and valve ensures the cleaning of the filter medium by means of a reverse flow of water, and specially provided outlet directs to the sewer that water with impurities collected on the filtering bed. The Buhring's Patent Water Purifying Company claim for their filtering medium that it is of such nature that it retains the chemical compounds, such as permanganate of potash, etc., sometimes used to purify raw water.

Among the numerous users of plants provided by this company may be noted the leading steamship and railway companies throughout the world, including the Royal Holland Lloyd Steamship Company, and the Hamburg-America line, the Societe Generale De Paris, and the great shipbuilding firm Messrs. Harland & Wolff.

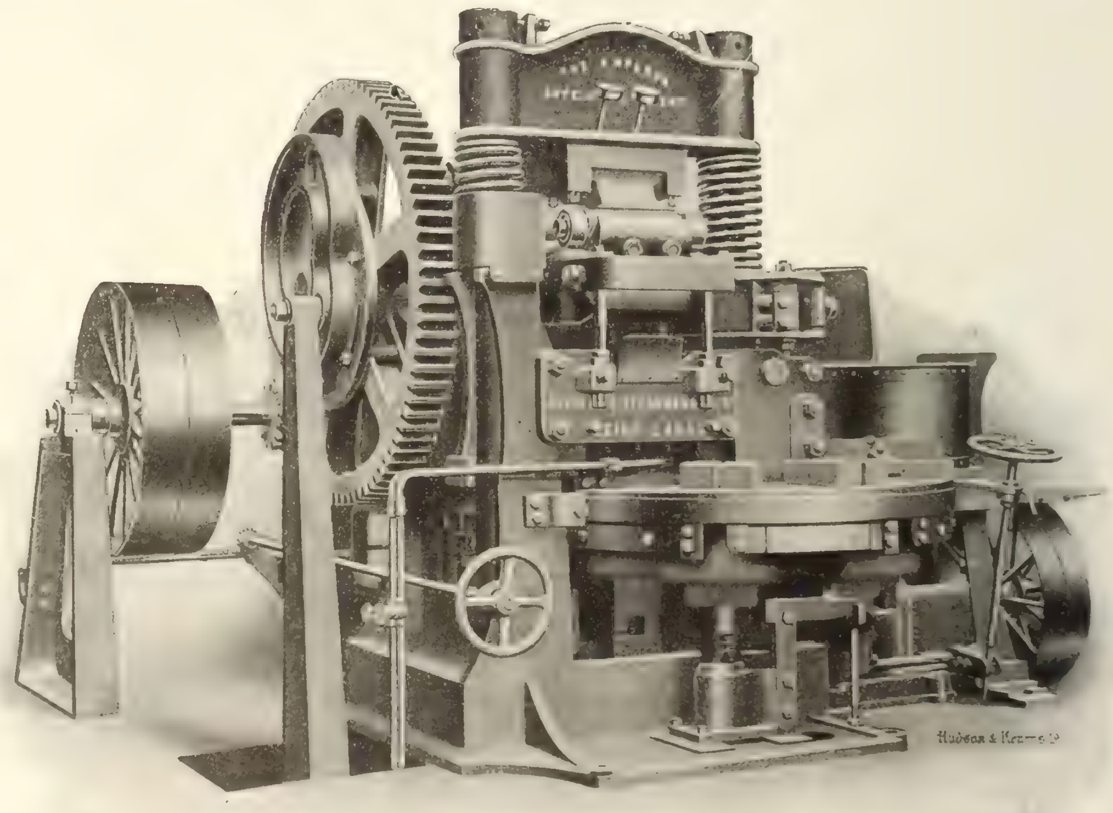
SUTCLIFFE, SPEAKMAN & COMPANY

Building, in the present day, demands a great variety in material, and economy in manufacture requires the utilizing wherever possible, of what was formerly waste products.

Messrs. Sutcliffe, Speakman & Company, Limited, Leigh, Lancashire, Eng., are the designers and manufacturers of a brick press which they claim will make bricks from material of every description, whether it be sand, refuse, clinker, slag, or any material akin to those enumerated.

The press is built on lines of strength and is so designed that parts subject to wear may be easily gotten at and replaced with the least possible loss of time. The bricks which are the product of the press have uniformity of size, correctness of shape and an evenness of surface which requires only one coat of plaster, while the tests made upon them for porosity and strength prove that they have excellent wearing properties. In addition, coloring matter may be added to produce any required color.

The machine has met with a wide sale. Mr. Sutcliffe who is the managing director of the firm, will visit Canada early in August for the purpose of thoroughly investigating trade prospects in this and other lines related to their business. The press mentioned is but one of the lines manufactured by the company. They design and construct machinery for the briquetting of iron, copper and other ores, and make all the necessary plant for such work. They have placed in operation works of this nature in Europe, Africa and America.



Brick press designed by Messrs. Sutcliffe, Speakman & Company, Limited.

PATERSON SYSTEM OF WATER PURIFICATION

The Paterson Engineering Company, Limited, 12 Norfolk Street, London, W.C., who are represented in Canada by Messrs. Laurie & Lamb, Board of Trade Building, Montreal, have been successful in securing some of the most important contracts for a rapid filtration and purification plant placed in Britain during 1913. This firm specialises in all types of water purifying and rapid filtration plant for municipal and industrial supply. In this brief notice, however, we shall confine our remarks to their system for the purification of drinking water and to the installation of Paterson plant at the Cheltenham waterworks, Gloucestershire, where the water as pumped from the Severn river is at times very turbid and highly discolored from marl, peat and decaying vegetable matter in the upper reaches of the stream.

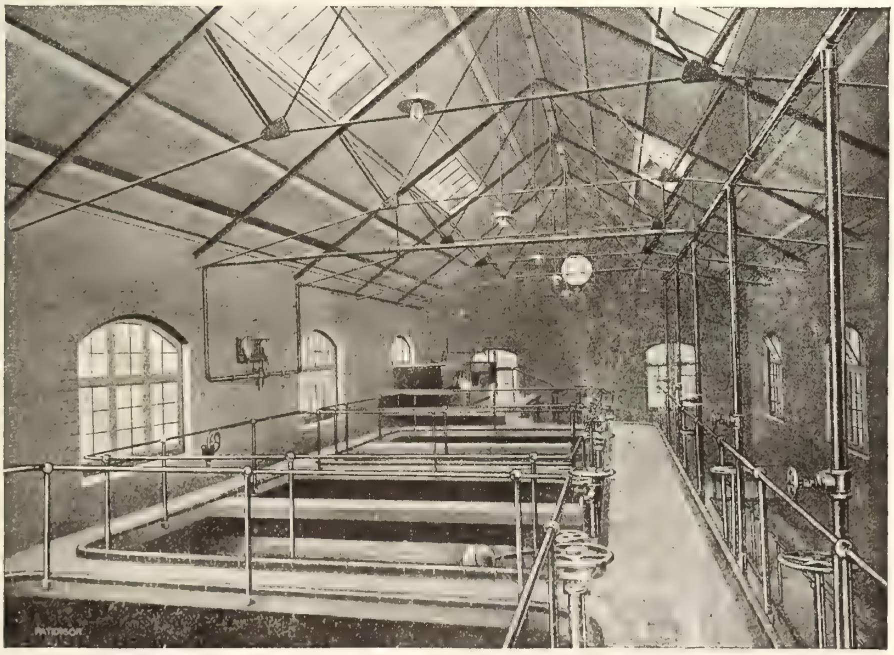
The water is measured and the necessary reagents (alumina for the removal of the colouring matter and coagulation of suspended impurities, and hypochlorite of lime for sterilization) are added in precise ratio to the amount of water passing. This is effected by metering the water by passing it over a weir. A large float controlling the position of a tapered valve gives an annular orifice which discharges the weight of chemical solution in accurate proportion to the amount of water passing. The water so treated, after three hours subsidence, passes on to the six Paterson gravity type filters, the quartz sand beds of which are cleansed in place in a very few minutes by agitating with sterilised compressed air, the loosened impurities being floated to the drain by a reverse current of cleansing water. This process of cleansing thoroughly scours the sand grains and keeps the bed fresh and wholesome, the lowest possible proportion of wash water being required. Further, the special construction of the Paterson manifold strainer system ensures uniform agitation of the filter bed, both the air and wash water reaching the most remote parts.

A feature deserving of special note is the Paterson automatic outlet controller, patents for which have been secured in all the important countries of the world. This controller—(a) prevents the maximum rating of the filter from being exceeded; (b) steadies the flow; (c) ensures a uniform rate of filtration; (d) prevents furrowing of the filtering surface; (e) maintains a constant head of water above the sand bed so that it is never drained below the sand level; (f) starts the filter gradually to work after the cleansing process and while the filtering film is forming, so ensuring that all water entering the service mains is of the highest degree of purity.

A report made by Dr. Samuel Rideal, the eminent authority on drinking water supplies, on samples of the untreated and treated water, proved that the total organisms were reduced from 2,500 to less than 1 per c.c.; and the coli organisms from 50 (or more) per c.c. to entirely absent from 100 c.c.

MANUFACTURERS OF STEEL AND WIRE ROPE

The Excelsior Wire Rope Company, Limited, Cardiff, South Wales, are among the largest manufacturers of steel and iron wire rope found in Great Britain. Their output includes ropes for mining operations, for ship hawsers, for dredging, lumbering and oil boring machinery and for the construction of suspension bridges, aerial railways and in fact, wire rope for all sorts of mining, shipping and engineering purposes. Their works cover an area of over three acres and while they are equipped for the manufacture of all sorts of wire rope, if they have any specialty, it is probably steel and wire cable for mining plants. The fact that the works are situated in the neighborhood of the Welsh collieries has doubtless caused them to specialize somewhat along this line.



Upper works of the Paterson rapid gravity filters installed at Cheltenham, Eng.

SURVEYING INSTRUMENTS

In most things the best are the cheapest in the end, but there is nothing in which this is so marked as in surveying instruments, as the very essence of their utility is that they should be absolutely reliable, and to be so, every part must be made with the greatest care and skill, and of the greatest accuracy obtainable. Consequently careless methods cannot obtain with the really high-class maker, as no matter what it costs to bring an instrument to the greatest possible accuracy, it should be done before it is allowed to leave the final adjusting shops, and this is a rule which the W. F. Stanley & Company, Limited, of Great Turnstile, London, England, claim is always carried out in their workshops and they further claim that by strictly adhering to this principle, and always being the leaders of nearly every improvement that has been made, they have justly become the largest manufacturers of surveying instruments in the world. Not only have they improved them, but they have also simplified them, and thus have made them more reliable and stronger than heretofore, and by the aid of special machinery, so many parts that were previously made in separate pieces screwed together, are now made in one solid piece, that the number of parts is reduced to about one-third, consequently with the extra strength thereby attained, and the smaller number of parts, they will last in adjustment much longer and stand much harder wear.

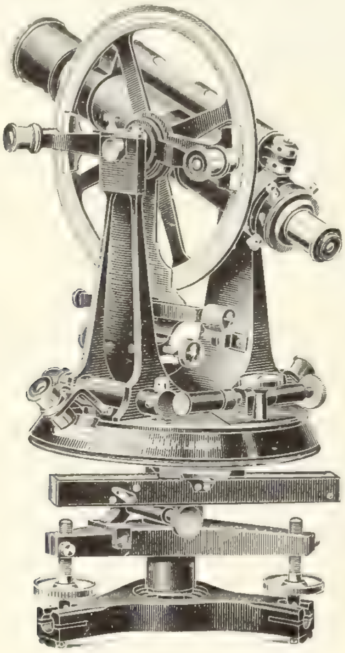


Fig. 1—Theodolite.

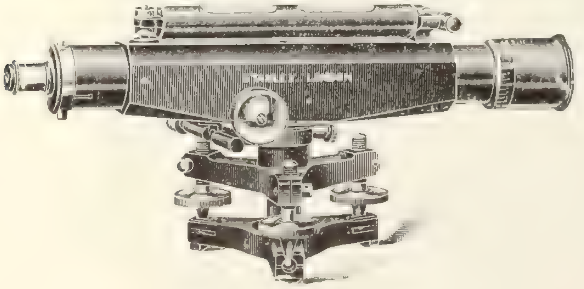


Fig. 2—Level.

As an example of two of the most ordinary instruments used in surveying, we give an illustration of a theodolite and of a level made by this firm, which show the simple, yet graceful strength of construction.

But notwithstanding their strength, every part is so carefully and mechanically designed that they are marked by their lightness in weight. Every part is made from special alloys of gunmetal, carefully worked out to the best for its particular purpose. These instruments being so solid and rigid, carry exceedingly sensitive bubbles. The lenses used are the finest that skill can produce, and last, but not least, the greatest care is taken in packing each instrument in its case, so that although it is held firmly at all necessary parts, it drops into its place without the slightest trouble. Every part of these instruments is made at the works of W. F. Stanley & Company, Limited, under special supervision from the alloying and founding of the metals to the finished instrument, including the levels, lenses, dividing, engraving and the hundred and one other processes. Although their own patterns are the result of over sixty years' practical experience, they are quite alive to meeting any demand for other patterns, and as the Canadian market demands, in many instances, the American pattern, they are now making these, and the work in them is of the highest class. An example of one of the simple transits is given below.

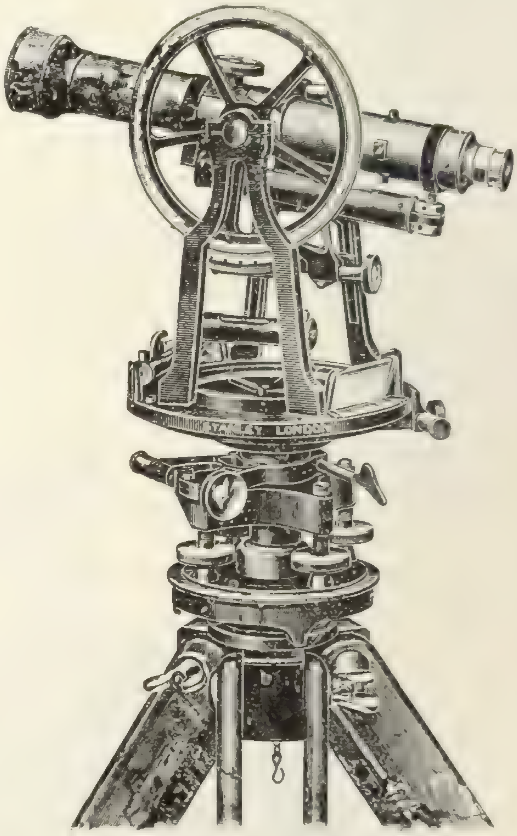


Fig. 3—Transit.

Some of the up-to-date mining outfits are masterpieces of completeness.

In their No. 1 outfit the instrument and targets have interchangeable centres for working the three tripod system; all have mechanical centering stages and quick setting lower plates, and the same transit is fitted with auxiliary top and side telescope for shaft work, etc.

The company would be pleased to send their latest catalogue to any one interested. It contains every item that a surveyor can want in field or office.

Sewage Disposal Plant Constructed at Lethbridge, Alberta

THE question as to the proper method of treating its sewage is one of vital interest to every community. Engineers and municipal administrators have given much thought to the solution of this problem and a great deal that is both interesting and valuable has been evolved. The method of sewage treatment by means of sewage disposal plants, while only in its infancy in Canada, is, nevertheless, growing in favor. The Adams Hydraulic, Limited, York, England, through their agents, Francis Hankin & Company, of Toronto, have either installed or have under construction, plants for sewage disposal at Regina, Sask.; Lethbridge, Alta.; North Toronto, Weston, Oshawa, Napanee, Guelph Prison Farm, Ont., and the Jordan Sanitorium, Moncton, N.B.

The Lethbridge plant may be taken as a standard installation and a description of its method of operation will give a general idea of the method of operating the plants constructed by this company.

The sewage disposal works at Lethbridge were designed to handle a daily minimum of 400,000 gallons and a daily maximum of 2,000,000 gallons. A very good idea of the general layout of the plant may be seen in Fig. 1.

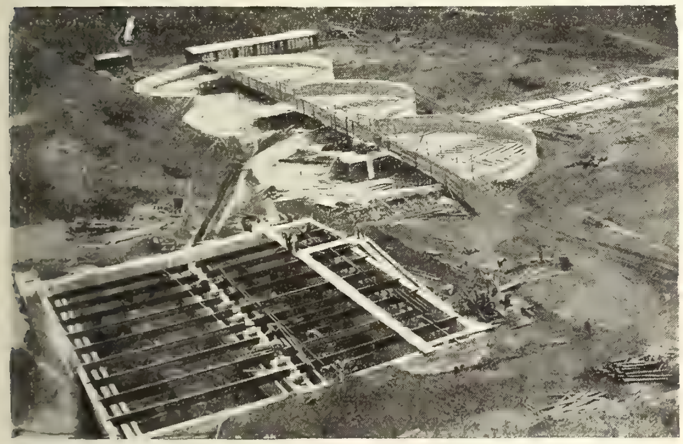


Fig. 1—General layout of the plant.

On entering the disposal works, the sewage first passes through screens and detritus tanks. These are simply primary settling tanks where the grosser solids are eliminated. It then passes on to the sedimentation tanks which are two in number, and so constructed that either may be shut off at any time for cleaning purposes. These tanks are each 100 feet long, 31 feet wide and 18 feet deep. They are of the two-storey type which allows the sewage to be kept fresh and completely separate from the solids which settle into the lower compartment of the tank.

The sludge is removed from the tanks about once every three months. This operation is easily accomplished by opening special sludge plugs which are placed at the lowest point in the compartment and are provided with an extension spindle carried up above the water level.

The tank effluent is discharged directly into three revolving sprinklers which distribute the effluent over the filter beds. These latter are each 108 feet in diameter and 7 feet in depth. The liquid is carried off to the main channel by means of ordinary field drains laid on concrete floor as illustrated in Fig. 2. The same bed with distributor and filter media in place ready for operation is shown in Fig. 3.

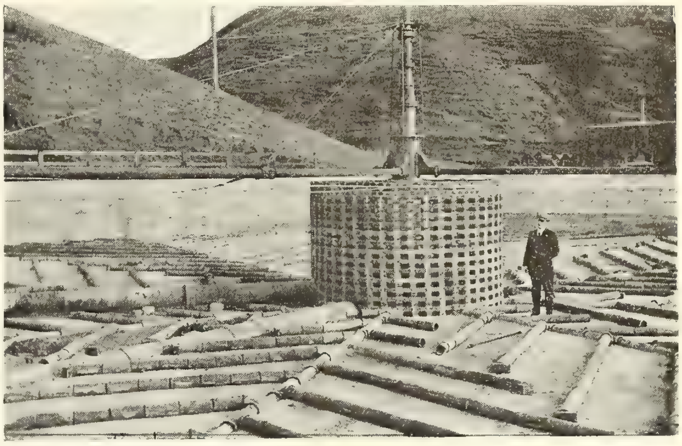


Fig. 2—Centre well and field tile in the bottom.

The clarified effluent passes to the humus tanks which are in duplicate. Each of these tanks is 80 feet long, 15 feet wide and 4 feet deep. Finally, before entering the river, the effluent is disinfected by adding a small percentage of chlorine.

The revolving sprinklers used in these plants are of the Adams' patent Cresset type. They are provided with a patent air lock cell which practically eliminates all friction and will revolve with so low a maximum head of sewage as 14 inches and finish off with 2 inches and require no other motive power.

In the past some doubt has been expressed as to whether revolving distributors were suitable for the Canadian climate, fear being expressed that they would freeze up. The Adams Hydraulic Company, Limited, claimed that if the filters were roofed the natural heat of the sewage would dispense with any need of artificial heat. This contention has been borne out by experience and in Lethbridge the machine actually ran all winter without a roof. Leaving the plant in this condition is, of course, taking serious risks.

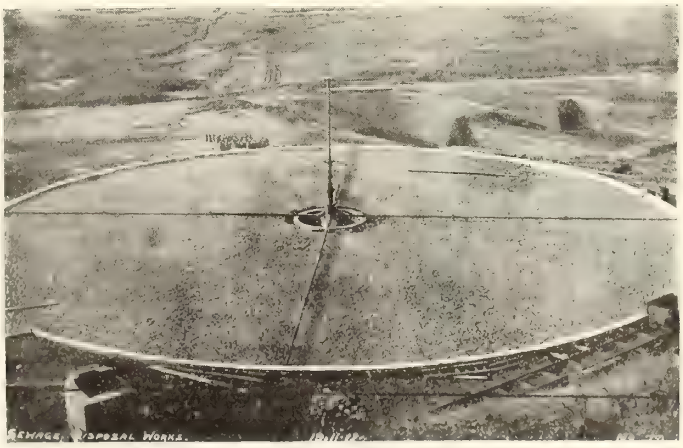


Fig. 3—Distributor and media in position ready for operation.

Canadian Railroad Development

It is reported that arrangements are being made whereby the C. N. R. will take over and build the Alberta and Great Waterways Railway.

Investigations are being made so as to locate the most advantageous point at which to make the junction with the C. P. R. from the line of the Lake Huron and Ontario Railway.

The Canadian Northern Railway's issue of $7,500,000 five per cent. secured notes at 98 has been oversubscribed, the lists being closed in advance. The scrip was quoted at 1-4 premium for special settlement.

The Montreal and Southern Counties Railway Company are engaged on a policy of expansion, with a view to opening up the southern shore of the St. Lawrence. Recently an electric line to Richelieu was put into operation, and a line to Marieville, four miles beyond, and 22 miles from Montreal, is now completed. A substation has been built at Chambly.

The Railway Commission has given judgment approving of the plans for the new Toronto viaduct which were agreed upon by the city railway companies and Toronto Harbor Commissioners, after prolonged negotiations. This practically settles the question of grade separation in connection with the viaduct. Work must be completed by July 29, 1916.

Canadian Pacific's preliminary income account for 1913 showed an increase of $14,076,000 in gross earnings, but only $46,245,000 of gross remained for net, showing an increase of $2,947,000 over 1912. The statement does not show how much of the increase in operating expenses went into maintenance, but the figures do indicate an increase of 3 per cent. in the operating ratio, 1913 figuring out 66 per cent., against 63 per cent. for 1912.

The dispute concerning the freight rates of the Intercolonial Railway will probably be settled within a few days. Conferences have been taking place between the Minister of Railways and Canals, the railway officials, and representatives of shippers. Concessions have been made by the railway authorities, mainly in the direction of making allowance for contracts based on lower rates. Other rates have been slightly modified, but the general increase will be about ten per cent.

The first estimate for the Union Station and viaduct, Toronto, was $10,000,000, but the original scheme has been so much amplified that the final cost will be much in excess of this figure. It will take three years at least to complete the work. It is interesting to note that the operating scheme to be included in the new Union Station arrangement will adhere to the plan first outlined. Mr. E. R. Ambrose, who has had charge of the grade separation at Sunnyside, will be entrusted with the responsibility of the Union Station and viaduct work.

The C. P. R. bridge at Highlands, across the St. Lawrence, will be completed by the Fall. One of the spans, 480 feet long, is erected on the up-stream side, and work has been commenced on the second span. When this is in position the bridge will be finished, thus giving the C. P. R. another double track into Montreal. The double track into St. Johns, P.Q., has been open for some time, and the extension to Farnham is proceeding. The whole of the work will, it is anticipated, be very shortly completed with the exception of the new bridge which has to be thrown across the river at St. Johns, the concrete foundation for which has been carried out.

Although only a year has elapsed since the first gang of men commenced work on the three and a quarter miles tunnel the Canadian Northern Railway is driving through Mount Royal to its extensive terminal property in the centre of the city of Montreal, sufficient progress has been made to enable the builders to predict the probable date of completion for the bore, and the date of its being opened, to handle its transcontinental traffic. Of the total length of 16,668 feet, 12,438 have been drilled. The heading—the primary bore—is 9 by 12 feet. The drill runners are expected to meet down in the depths of the mountain before the end of the present year, and there seems to be no doubt that they will meet and the daylight will be filtering through the historic old mountain, which has held up the expansion of Canada's eastern metropolis for so long.

Twenty-five thousand men and three thousand teams are at work on the grade of the main line of the Canadian Northern Railway, west of Edmonton, with a view to doubling the mileage now in operation before the close of the season. It is planned to have the line between Edmonton and the Pacific coast completed before the end of 1914. Sir William Mackenzie announces that the company has placed orders for the necessary rolling stock. Steel has been laid to the Albreda summit, through the Yellowhead Pass, 350 miles west of here. Westward from Port Mann, the terminus on the Pacific coast, the work is well advanced, and it is given out that the head of steel should reach Kamloops, B.C., at the end of the year. The company has 594 miles of line in operation in this province. This will be increased to more than 1,000 miles at the beginning of 1914. Progress is also reported on the branch lines south of Edmonton.

It is understood that the Department of Railways and Canals is about to take over the International, formerly the Restigouche and Western Railway, running from Campbellton, N.B., on the I. C. R., to St. Leonard's on the St. John river, a distance of 112 miles. This transfer will be made on the authority received from Parliament by the Hon. Frank Cochrane to take over all roads connected with the government system, the International being one of the first to be required under the act in question. This important railway, which is about to be operated by the Intercolonial, was built by Mr. Thomas Malcolm, the well-known New Brunswick contractor, and a very large business has been worked up between Baie des Chaleurs and the St. John river and extending into Maine. It is looked upon as one of the best feeders the I. C. R. could secure. The road-bed is in first class shape and an up-to-date passenger and freight service has been given by the road during the past year and a half.

Mainly Constructional

The News in Brief—From Coast to Coast

Mr. F. L. Fellowes, city engineer of Vancouver, is now sufficiently convalescent to return to his office.

Messrs. Cloutier & George, Rapid City, Man., recently started the manufacture of brick in their new brickyard there.

Mr. R. V. Holland, who has been connected with the Canadian Light & Power Company, Montreal, as superintendent, from September, 1911, when the company commenced operating, ceases his connection with the company August 1st.

Good progress is being made by the night and day shifts on the Rideau Hall improvements, Ottawa, and they are expected to be completed by the time the Duke of Connaught returns on October 25. A new entrance and a partially new front are the principal changes made.

Mr. W. A. Elliott, the well-known Brandon architect, who was recently appointed chief inspector of the new provincial parliament buildings in Winnipeg, has now taken up his quarters in Winnipeg. Work has commenced on the buildings and the caissons are now being put in. They are placed on the bed-rock which, in some cases, is fifty-four feet below the surface.

It is announced from Ottawa that plans are well advanced and tenders will shortly be called for the Dominion Government interior storage elevator to be constructed at Saskatoon. Work will be commenced during the fall. The elevator, which is to be the initial unit of the government's scheme, will have a capacity of 3,000,000 bushels and will cost about $2,000,000.

According to Mr. M. P. Davis, the contractor for the substructure of the Quebec bridge, the work will be completed by November 15. The St. Lawrence Bridge Company, which has the contract for the superstructure, will then commence work. Mr. Davis expressed the opinion that it will take another four years to complete the bridge and that it will not be ready for operation until 1917.

Mr. Leigh Hunt, of the Hunt Engineering Company, recently took out four engineers and their supplies to the site where the Canada Cement Company's plant is being built at Medicine Hat. Permanent construction work on the cement plant has been started and is being rapidly pushed. Mr. Hunt stated that from ten to fifteen men are being added daily to the permanent construction force.

The Industrial Engineering & Machinery Company, Limited, located in the Shaughnessy Building, Montreal, have taken the agency for Chain Belt Concrete Mixers, manufactured in Milwaukee, Wisconsin, and will act as exclusive agents in this territory. The officers of The Industrial Engineering & Machinery Company are Theo. J. Mullen and J. C. Grant, formerly engineers of the Allis-Chalmers-Bullock Company.

The building record by provinces shows that only the Maritime and Ontario cities showed an aggregate increase during July. An 87 per cent. advance made by the two chief cities of the Maritimes and a 38 per cent. increase by nineteen cities of Ontario bespeaks a substantial development in these provinces, while the remainder exhibit a marked tendency to ease up. In British Columbia cities the decrease for the month was 77 per cent.; that for Saskatchewan cities, 63 per cent.; Manitoba, 51 per cent., and Alberta 23 per cent.

The annual convention of the Canadian Society of Stationary Engineers held at Owen Sound on July 29-31. A very successful meeting was held and the citizens of Owen Sound extended a warm welcome to all those attending the convention. The following officers were elected: Past president, J. A. Robertson, Stratford; president, S. E. Cosford, London; vice-president, W. A. Heath, Hamilton; conductor, R. Dyson, Guelph; doorkeeper, E. Hooey, Owen Sound; secretary, A. Kastella, Ottawa; treasurer, W. E. Archer, Toronto.

The London, Ont., Pressed Brick and Tile Company, in which a number of local capitalists are interested, have secured property eighteen acres in extent, on the line of the London and Lake Erie Railway in Westminster Township, just south of the city limits, and will proceed at once with the installation of a plant for the manufacture of all classes of clay products, viz.: brick, roofing tile, floor tile, wall sheathing, paving bricks, terra cotta, ornamental designs and moldings. The plant will have a capacity of about twenty thousand bricks a day, the clay for their manufacture being found on the premises.

The Ontario Commission on Highways Improvement held the first meeting recently at the Parliament Buildings, Toronto, and organized. The commission will thoroughly investigate the highways of Ontario, and prepare a report on the best means of improving them. The meeting to-day was taken up entirely with preliminary organization, and the actual investigation will not start for some time. Mr. Chas. A. Magrath, C.E., was made chairman of the commission. Mr. W. A. MacLean, Provincial Engineer of Highways, vice-chairman and secretary.

Application is being made to the Department of Public Works by the Amalgamated Drydock and Engineering Company of Vancouver for a subsidy for the construction at Vancouver of a floating drydock to cost $2,500,000. The dock will be capable of accommodating the largest class of vessels plying on the Pacific Ocean, and the promoters will doubtless receive the encouragement of the Dominion Government if their plans are suitable. The chief engineer of the Department of Public Works will make a report on the plans before the usual subsidy of 2½ per cent. is granted.

The Ambursen Hydraulic Construction Company of Canada, Limited, have just closed the following contracts: A concrete steel dam of the Ambursen type for water supply purposes, for the town of Swift Current, Sask. The dam is approximately 840 feet in length over all, 180 feet of this being spillway of the full apron type, and the balance, concrete core wall and earth embankments. The dam is about 25 feet high in the centre; estimated cost of the work is $86,000. Construction has already started. Also a concrete steel dam of the Ambursen type for the Maritime Coal, Railway & Power Company at Maccan, N.S., for water supply purposes; the total length of this dam is about 200 feet, height about 22 feet; the estimated cost is $11,100. Construction will start immediately.

It is officially announced from Ottawa that the contract for the completion of the first unit of the north jetty at the Fraser river sandheads has been awarded to Broley & Martin, of New Westminster and Vancouver. The contractors agree to complete the jetty for $83,500, the aggregate of the bids for finishing the various parts of the work. Lead piling must be driven for 300 feet, 1,100 feet of sheet piling, 2,400 feet of mattressing and 2,400 feet of rock work must be done, and included in the contract is 1,400 tons of rock to be placed on the completed portion of the work. The contractors are given twelve months to complete the work in, and thirty days in which to assemble plant and begin it. It is expected, however, that the contract will be completed within less than six months so that the contract can be let for the second unit and work on it commenced next spring.

The world's highest head water power plant is being constructed at Martigny, Switzerland. The fall is 5,400 ft. and the pipes conveying the water from the head of the fall to the power house, a distance of three miles, are specially remarkable. The pressure gradually increases with the fall till the lowest part is reached, where the pipe, having to withstand 2,500 lbs. per square inch, had to be made of special ingot-pressed steel. The turbines, which are of the Pelton type, have a total rating of 15,000 h.p., and it is of interest to note that, with the 5,400-ft. head, only about 30 cu. ft. of water per second will be necessary to develop the full 15,000 h.p. output of the station.

What is your aim in life? What have you thus far accomplished worthy of commendation? Answer yourself honestly. It may surprise you.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Waterworks, Sewerage and Roadways

Brockville, Ont.
One mile of pavement on King street planned by Town Council. Mayor, R. McKenzie. Clerk, Geo. Dewey. Engineer, Geo. Bryson.

Tenders received by Clerk, Geo. Dewey until August 22nd, for construction of cement walks on about 12 streets in different parts of town. Plans, specifications, etc., at office of Engineer, Geo. Bryson.

Burlington, Ont.
8,403 feet of sidewalks of either cement concrete or granolithic construction planned. Reeve, M. C. Smith. Clerk, J. S. Allen. By-law has passed council.

Twp. of Brantford, Ont.
Cement sidewalks. Engineer, Alan Muir, Jackson Temple Bldg., Brantford, for construction of 7,810 lin. ft. of 4-in. cement sidewalk. Plans, specifications, etc., at office of Engineer. Tenders received by Clerk, J. A. Smith, County Bldgs., Brantford, Ont., until Aug. 30th.

Dorval, Que.
Grading of streets. Address Alp. Decary, Quebec Bank Bldg., Montreal. Plans, etc., at office of engineer, V. H. Dupont, 125 St. James Street, Montreal. Tenders will be called shortly.

Dundas, Ont.
Town Council is looking into matter of erecting pumping station and filtration plant at canal to replace or augment present waterworks system. Reeve, Chas. Collins, is Chairman of Committee.

Dundas, Ont.
600 feet cement walk, Mountain, planned by Town Council. Clerk, J. S. Fry. Chairman Board of Works, A. B. Wilson.

Hull, Que.
Surveys have been made by City of Hull and Provincial Government for 2½ miles macadam roadway, cost $25,000. Mayor, Mr. Dupuis. City engineer, J. A. Laforest.

Kincardine, Ont.
Waterworks planned by Town Council (Waterworks Commissioners). Chairman, Ex.-Mayor Patterson. Operations commenced on Waterworks extension. Masonry and roofing to be let.

Lethbridge, Sask.
Town Council contemplate constructing 30-in. and 54-in. sewer for storm water purposes. Engineer, W. S. Harvey.

London, Ont.
New cement walks will be laid on Bathurst street from Waterloo to Colborne and on York from Wellington to Colborne. Tenders to be called shortly. Chairman, B. W. Bennett. Engineer W. N. Ashplant.

Morris Twp., Ont.
Tenders received by Clerk, A. McEwen, Bluevale, Ont., until August 25th. for construction of complete new Black & Ellis tile drains.

Redcliffe, Alta.
By-law passed providing for the expenditure of $100,000 for the extension of water system.

Richmond, Ont.
Concrete walks. Tenders received by clerk until August 30th, for construction of 1,881 feet of sidewalk, 5 ft. wide; price wanted per square foot. Specifications at office of clerk, John Reilly.

St. Catharines, Ont.
Rocmac roadway, 30 feet wide, St. Paul. Clerk, J. A. Pay. Engineer, W. P. Near. Plans drawn.

Bitulithic pavements planned by City Council. Clerk, J. A. Pay. By-law passed first reading. $34,599, Queenston St., from St. Paul to Vine. $19,810, King St. from Ontario to Mary. $54,398 for various local improvements.

Toronto, Ont.
Tenders received by H. C. Hocken, Mayor, until August 26th noon, for supply and erection of three motor-driven centrifugal sewage pumps, automatically controlled, for main drainage works. Plans, etc., at office of Commissioner of Works.

Wingham, Ont.
Council plans to lay new 4-in. water drain on Edward and Victoria streets.

CONTRACTS AWARDED

Barrie, Ont.
Pavements planned. Clerk, Elijah Donnell. General contractors, Curran & Clement, Orillia.

Huntingdon, Que.
General contractors, O'Conner Bros., for macadamizing 4 miles of roads. Sec.-treas., R. S. Feeny.

Montreal, Que.
Paving, Board of Control. Secretary, L. N. Senecal. General contractors, Quinlan & Robertson, Galt ave., for laying of granite blocks on Cote St. Paul Road at $1.80 per square yard. Blocks supplied by city.

Pump station No. 7, cost $10,000, foot of Atwater. L. N. Senecal, Secretary, Board of Commissioners. Builders, Murray & McRitchie, Coristine Bldg. Brick construction, felt and gravel roofing. All work done by builder.

North Battleford, Sask.
Water main. Engineer, J. B. Sterling, City Hall. General contractors, Cookson Bros. 600 ft. of 12-in. lapwelded steel pipe wrapped and cased.

Ottawa, Ont.
Pavements. Mayor, J. A. Ellis. City Engineer, Archibald Currie, City Hall Contracts awarded to Union Construction Co., Bank street, for pavements on Rochester street between Somerset and Ellen street, including curb, gutter, headers, and sidewalk. To Ottawa Construction Co., Central Chambers, for asphalt pavement on Centre street between Bank and Craig streets, including curb, gutters, headers, setts, etc., and for work on St. Andrew street from King Edward ave. to St. Joseph street

St. Martin, Que.
Macadamizing roadways. Secretary, Nap. Mallette. General contractors, R. T. Smith & Co., 175 Metcalfe ave.

Toronto, Ont.
Grading planned by York Township Council. Clerk, W. A. Clarke, 40 James street. General contractors, International Contracting Co. Grading DeGrassi Hill, Todmorden. Highway Commissioners will build macadam roadway after grading is finished.

Railroads, Bridges and Wharves

Harbor improvements, cost $50,000, planned by Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Tenders called shortly.

Canoe, B.C.
Wharf. Tenders received till Sept 11 by Secretary, R. C. Desrochers, Ottawa. Dom. Govt., Dept. of Public Works. Specifications, plans, etc., at offices of F. W. Aylmer, Dist. Engineer, Chase, B.C., J. S. McLachlan, Dist. Engineer, Victoria, and Postmaster, Canoe.

Chambly, Que.
Steel bridge, cost $4,000. Dom. Govt., Dept. of Railways and Canals. Secretary, L. K. Jones, Ottawa. Plans, specifications, etc., at office of chief engineer, Dept. of Railways & Canals, Ottawa, and Supt. Engineer, Marceau, New Birks Bldg., Montreal. Tenders will be called shortly.

Cogagne, N.B.
Wharf, cost $10,000, planned by Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Tenders called shortly.

Dundas, Ont.
T. H. & B. Rly. Co. are preparing plans for spur into premises of Jones Bros. Length about 700 ft.

Deer Island, N.B.
Wharf extension planned by Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Work at Chocolate Cove. Tenders will probably be called early in September.

Edmonton, Alta.
Car barns, cost $3,000, Algonquin ave. for Edmonton Interurban Railway, C. P. R. Bldg. One storey, 34 x 64, frame

construction and foundation, shingle rfg. Plans ready. Excavating started.

Haldimand County, Ont. (Near Indian Line

New bridge has been ordered by County Council in accordance with report of Committee. Plans in progress. Clerk, T. A. Snider, Dunnville. Engineers-in-charge, Jackson & Kyd, Dunnville.

Little Dipper Harbor, N.B.

Breakwater, cost 12,000, planned by Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Tenders called shortly.

Montrtal, Que.

Tenders received by Sec., L. K. Jones, Dom. Govt. Dept. of Railways and Canals, until noon September 2nd, for construction of concrete foundation and floor St. Gabriel shed No. 1, Lachine Canal. Plans, etc., at office of Chief Engineer, Dept., Ottawa, and Supt. Engineer of Que. Canals, New Birks Bldg., Montreal.

Wharf, Marlborough, contemplated by Harbor Commissioners, 57 Common St. Chief Engineer, F. A. Cowie. Land purchased and plans will be prepared.

New entrance to Lachine Canal, Twin lift lock from basin above Black's Bridge to Windmill Point basin, planned by Dom. Govt., Dept. of Railways & Canals. Secretary, L. K. Jones, Ottawa.

Morinville, Alta.

Canadian Northern Railway Company have been ordered to enlarge present station at Morinville to provide a waiting room at least 30 x 30 ft. with seats for accommodation of the public. Lengthen platform to accommodate four passenger trains, and erect a freight shed independent of the passenger station.

Sandwich, Ont.

Steam railway three miles long, planned for Essex Terminal Railway. Plans and specifications at office of Manager, Wm. Woollatt, Walkerville.

Shelter Point, B.C.

Wharf, Gillies Bay. Dom. Govt., Dept. of Public Works. Secretary, R. S. Desrochers, Ottawa. Specifications, plans, etc., at C. C. Worsfold, District Engineer, New Westminster, Postmaster, Vancouver and Department, Ottawa. Tenders received till September 15th by Secretary.

Victoria, B. C.

Harbour improvements, cost $2,000,000, Ogden Point, planned by Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Tenders to be called shortly. Two piers, one 1,000 ft. long, one 870 ft. long, concrete and cribwork.

Victoria Harbor, Ont.

Tenders received by Dom. Govt., Dept. of Public Works, Secretary, R. C. Desrochers, Ottawa, until September 8th for construction of wharf at Victoria Harbor, Ont. Plans, specifications, at offices of J. H. Armstrong, Dist. Engineer, Midland, Ont., J. G. Sing, Dist. Engineer, Confederation Life Bldg., Toronto, and Postmaster at Victoria Harbor.

Westbourne, Man.

Bridge planned by Prov. Govt., Dept. of Public Works, Winnipeg. Minister, G. R. Coldwell, Winnipeg. Tenders received for removing and replacing of bridge over Whitemud River between sec. 30 and 31, Twp. 14, Range 10 west in municipality of Westbourne by Minister till August 22nd.

CONTRACTS AWARDED

Batiscan, Que.

Improvements to wharf, cost $15,000, planned by Dom. Govt., Dept. of Public Works, Secretary, R. C. Desrochers, Ottawa. General contractors, Gruniyer & Dalton.

Blandford Twp., Ont.

Drain. Clerk, W. G. Henderson, Bright, Ont. Engineer in charge, F. J. Ure, Woodstock. General contractors, B. Blair & Co., Woodstock. "Silcox Drain," 5,993 ft. 6-in. to 14-in. tile. "Colder Drain" 5,314 ft. 12-in., 14-in., 18-in. tile.

Dundas, Ont.

Bridge, for T. H. & B. Rly. General contractors, Ontario Bridge Co., Crown Office Bldg., Toronto. One span, 30 ft., on line of spur into Jones Bros. factory.

Port Stanley, Ont.

Cement breakwater, 300 ft. long, for residents of Orchard Beach. General contractor, Mr. A. E. Ponsford, 605 Talbot St., St. Thomas, Ont. Work will start as soon as possible.

Essex Co., Ont.

Three bridges planned by County Council. Clerk, John Milne, Sandwich, Ont. General contractors, Sarnia Bridge Co., Sarnia. Two bridges over Belle River and one over Russell River, in Rochester Twp. One and two spans, 120 ft., 85 ft. and 80 ft. long.

Fort William, Ont.

Electric shop, cost $15,000, planned by Canadian Pacific Railway. General contractor, I. H. Simons, Winnipeg. One storey, 32 x 80, brick, cement foundation. Excavating started.

Galt, Ont.

Cement dam across Grand River. Clerk, Jos. McCartney. General contractors, Thomas and Hancock. 280 ft. long, 10 ft. high.

Haileybury, Ont.

Spur for Temiskaming & Northern Ontario Railway. General contractor, Jos. Roycroft.

Harriston, Ont.

Two bridges planned by Municipal Council. Road Commissioner, J. M. Young. Engineers, Bowman & Connor, 36 Toronto street, Toronto. Contracts awarded to Jno. Tilker, Fordwich, Ont., $950, and Jno. Gaffrey, Kennicott, Ont., $735. 22 x 18 and 30 x 20, reinforced concrete.

Five bridges. Reeve, W. C. Dryden. Clerk, W. D. McLellan. Contracts awarded to Jos. Schickler, Deemerton, $1,050, and $240, Mr. Brown, Clifford, Ont., two, $120 each, Jno. Tilker, Fordwich, $120.

Montreal, Que.

Contract for construction of the new pattern shop for the National Bridge Co., has been awarded to A. F. Byers & Co., Ltd., Engineers and contractors, 340 University street, Montreal. Will sublet roofing. Tenders open.

Prov. of New Brunswick

Dredging north and south Miramichi rivers. Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractor, Peter England, Chatham, N.B.

Sault Ste. Marie, Ont.

Dredging, cost $62,000, planned by Dom. Govt., Dept. of Public Works, Secretary, R. C. Desrochers, Ottawa. General contractors, Soo Dredging & Construction Company.

Toronto, Ont.

Bridges for County of Halton and County of Wellington. Engineers, Bowman & Connor, 36 Toronto street. General contractor, H. E. Craft, Guelph, for concrete bridge at Eden Mills, $2,000.

Public Buildings, Churches, Schools, etc.

Caledonia, Ont.

Drill Hall planned by Dom. Govt., Department of Militia & Defence. Secretary, E. F. Jarvis, Ottawa. Brick constr.

Cowichan, B.C.

Post office, cost $40,000, Craig and Kenneth. Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Three storeys and basement, 66 x 65, stone and brick construction. Plans in progress.

Dorval, Que.

Military school contemplated by Dom. Govt. Dept. of Militia & Defence. Sec., E. F. Jarvis, Ottawa. Plans under advisement at Ottawa. Site has been purchased.

Grimsby, Ont.

Pre cooling plant for fruit and vegetables, cost $12,000, planned by Dom. Govt., Dept. of Agriculture. Secretary, A. L. Jarvis, Ottawa.

Louth Twp., Ont.

School, cost $14,000, for Trustees Union School, Dist. No. 1, Louth and Grantham. Chairman, J. Roland, Power Glen, St. Catharines. Architect, A. E. Nicholson, 46 Queen St., St. Catharines. One storey, brick construction, stone foundation. Two rooms and physical training room. Plans in progress.

Leonardville, N.B.

Tenders addressed to A. Johnston, Deputy Minister of Marine & Fisheries, Ottawa, received until Sept, 2 for construction of a wooden lighthouse tower here. Plans, specifications, etc., at this Dept., Ottawa and St. John and post offices at St. Andrews, Campobello, Leonardville and St. Stephen.

Killooet, B.C.

School. Tenders received by Prov. Govt., Dept. Public Works, Victoria, Hon. Thos. Taylor, Minister, till August 29th. Plans, specifications, etc., at offices of S. A. Fletcher, Govt. Agent, New Westminster, D. C. Webber, Sec. School Board, Haney, B.C., and at Dept., Victoria.

London, Ont.

Mausoleum for International Mausoleum Co., Ltd., 36 King St. E., Toronto. Architect, owners. Cement foundation, Roman stone and reinforced concrete construction. Plans in progress.

McCaluey Twp., Ont.

School addition planned for Union School District No. 2. Plans, specifications, etc., at office of Secretary, Geo.

Yearley, Falkenburg Station, Ont., who will receive tenders. Brick veneer construction,

Maillardville, B.C.

Moving picture theatre planned. Architects, O'Brian & Murphy, Port Coquitlam. If plans are approved work will commence.

Medicine Hat, Alta.

Three public schools, cost $3,000 each, Charles St., Elizabeth St. and Second ave. President, W. Huckvale. One sty., 25 x 45, frame construction, cement fndn. Plans in progress.

Montreal, Que.

Public bath, St. Joseph Ward, Seigneurs St., planned by Board of Commissioners. Sec. of Commissioners, L. N. Senecal.

Fire station, St. Denis Ward, De la Roche St., contemplated by Board of Control. Sec. of Commissioners, L. N. Senecal. Fire chief Tremblay.

Church, cost $100,000, contemplated for Sherbrooke St. Methodist Congregation. Pastor, Rev. A. A. Radley, 6 Sherbrooke St. W. New site will be purchaed when present church is sold. Architect not chosen.

School contemplated by School Commissioners of Notre Dame de Grace, c/o Mr. Duncan, 747 St. Catherine St. W. Plans will be prepared.

Church, Decarie Blvd., planned for St. Luke's Congregation, c/o W. R. Cruikshanke, 115 Drummond. To be built in the fall after new minister comes.

College building contemplated for Union College Board of Governors. Principals, E. Munsen Hill, 60 McTavish; E. I. Roxford, Diocesan College; Jno. Scrimger, 69 McTavish; Jas. Smith, Principal of Wesleyan Theological College. Architect not chosen. Will not be built for a year.

School, cost $80,000 (St. James Parish, St. Andre and St. Christophe Sts.). Owner, R. C. School Commissioners, c/o U. Lafontaine, Com. Academy, 35 St. Catherine W. Architects, Venne & Labelle, 5 Beaver Hall Sq. Heating and ventilating, Canadian Domestic Engineering Co., Ltd., 5 Beaver Hall Square. Plans in progress.

Club and gymnasium, cost $25,000, Maisonneuve. Owner, Club Canadian Champetre, Sault Au Recollect, Que. Architect, C. A. Reeves, 58 St. James street. Forty rooms, dance hall, concrete foundation, frame construction. Plans in progress.

School, Greenfield Park (Patenaude) for School Commissioners of Greenfield Park, c/o Mr. Dawson. Plans in progress.

New Westminster, B.C.

School. Tenders received till September 1st by Minister, Hon. Thos. Taylor, Prov. Govt. Dept. of Public Works, Victoria. Plans, specifications, etc., at offices of A. G. Marshall, Sec. School Board, S. Westminster; S. A. Fletcher, Govt. Agent, New Westminster, and at Dept., Victoria.

Ottawa, Ont.

Tenders received by Dom. Govt., Department of Public Works, Secretary, R. C. Desrochers, Ottawa, for supply of sorting cases for post offices. Plans, specifications, etc., at offices of T. A. Hastings, Clerk of Works, Postal Station "F," Toronto, R. L. Deschamps, Supt., Montreal, General Post Office and Department, Ottawa.

Lavatory, cost $15,000, planned. Architect, F. C. Sullivan, Castle Bldg., Queen street. Plans approved by City Council. Tenders will be called. Concrete foundation, solid brick construction.

St. Genevieve, Que.

School contemplated by R. C. School Commissioners. Plans will be prepared.

Steelton, Ont.

Post office planned by Dom. Govt., Department of Public Works. Secretary, R. C. Desrochers, Ottawa. Architect, Thos. R. Wilks, 612 Queen St., Sault Ste. Marie. Plans, specifications, at offices of architect and Department. Tenders received by secretary until 4 p.m., Sept 9.

Toronto, Ont.

Church, cost $30,000, for St. Martins Congregation (Ang.). Pastor, Rev. S. D. K. Sweatman, 209 Perth Ave. Site purchased cor. Woodville and Conduit Strets, and plans will be prepared.

Church and Sunday School, cost $50,000, Sunnyside, for Howard Park Methodist Church. Tenders now being received by architect, W. G. Burns, 74 Indian Grove. Two storeys, 54 x 108, steel and stone construction and foundation.

Vancouver, B.C.

Theatre planned, Keefer street. Architect, J. J. Domiellan, 319 Pender St. W. 75 x 120, fireproof construction, seating capacity, 1,700, stage, 32 x 73, heating and ventilating system. Present tenders include everything except mechanical equipment.

Wallaceburg, Ont.

Addition to Sunday School, cost $12,000, for Knox Church Congregation. Secretary, Board of Managers, E. W. Shaw. Architect not yet chosen. Two storeys, white brick construction, brick foundation. Plans will be prepared.

Winnipeg, Man.

School, cost $3,000, St. Boniface, planned by Prov. Govt., Dept. of Education. Architect, V. W. Horwood, 261 Fort St. 40 x 23, concrete foundation, frame construction, shingle roofing. Tenders received by F. Paquin, St. Boniface, for all trades.

Wolfville, N.S.

College residence, cost $30,000, for The Acadia University. President, Dr. Geo. B. Cullen. Architect, Chas. Herbert McClare, Cambridge, Mass. 2½ storeys & basement. Sketches drawn.

Library and museum, cost $30,000, for Acadia University. President, Dr. Geo. B. Cullen. Architect, A. R. Cobb, Halifax, N.S. 2½ storeys and basement, stone foundation and construction, hot water heating, electric lighting, slate rfg., concrete floors in basement. Contract will be awarded in a few days. Private tenders were called.

CONTRACTS AWARDED

Brampton, Ont.

Hockey rink, cost $10,000, for Thauburn, Dawson & Hodgson. General contractor, Wm. Wedgewood. One storey, 200 x 100, brick and frame construction, cement foundation, seating required.

Drill hall, cost $16,000. Dom. Govt. Dept. of Public Works, Secretary, R. C. Desrochers, Ottawa. General contractor, W. A. Thom, Collingwood, Ont.

Edmonton, Alta.

School, cost $3,500, Johnson, for Public School Board. Sec.-treas., M. Brady Architect, Mr. Turner, Mortlake Block General contractors, Peppard & Son General Delivery. Two storeys, 26 x 33 ft. 6 in., frame, brick foundation.

Public school, cost $3,500, Hudson Bay Reserve. Sec.-treas., Mr. Bradey, Mortlake Block. Architect, J. Turner, Mortlake Block. General contractors, Geary & Jamieson, 622 1st street. Two storeys, 26 x 33, frame, brick foundation.

Kemptville, Ont.

Drill hall, cost $12,000, planned by Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractor, John Dillon, Kemptville, Ont.

Le Pas, Man.

Wireless station, cost $75,000, for Marconi Telegraph Co., 137 McGill St., Montreal. General contractors, Coyle & Hughes, Winnipeg. For operating house, cost $6,000.

Midland, Ont.

Orange hall, cost $7,130. General contractor, Thos. Bath.

Millbrook, Ont.

Drill Hall, cost $11,800. Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractor, R. Gheehy, 269 Rubidge St., Peterborough, Ont.

Montreal, Que.

Alterations to Convent, cost $5,000, Outremont (314 St. Catherine Rd.), for Loewis Missionaires de l'Immaculate Conception, 314 St. Catherine Road. Architect, Chas. Chausse, 17 Pagnuelo. Brick, O. Archambault, 575 Visitation. Masonry, O. Filion & Frere, 869 de St. Valier. Carpenter, Jos. Collette, 202 Chateauguay. Roofing, heating and plumbing, D. Benoit, 1975 St. Lawrence Blvd. Plastering and painting not let Stone foundation, brick construction.

Synagogue, cost $4,000, for L. Shapiro, 3071 Clarke. General contractor, Mr. Salzsky, c/o owner. Two storeys, 40 x 60, concrete foundation, brick construction. Foundation only will be built now. The remainder later.

Port Arthur, Ont.

Church, cost $75,000, Waverley St., for St. Paul Presbyterian Congregation. Sec. treas., W. C. McLean. Architects, Hood & Scott, Ruttan Bldg. General contractors, masonry, carpentry, iron and steel, roofing and painting, Marsh-Hutton-Powers Co., Prince Arthur Hotel Bldg. Heating and plumbing, J. W. Barnes & Co., Park street. 77 x 105 ft. 4½ in., cement foundation, Minneapolis stone and sandstone, reinforced concrete, red clay brick and structural steel.

Ottawa, Ont.

School, cost $85,000, Bronson, planned by Public School Board, Elgin St. Architect, W. B. Garvock, Creighton St. School. Mason, Geo. Crain, Clemow Ave. Foundations in.

Prince Rupert, B.C.

Quarantine station, Dom. Govt. Dept.

of Public Works. Sec., R. C. Desrochers Ottawa. General contractor, E. Kaufman.

Quebec, Que.
Church, cost $14,000, 53 St. Augustin St., for the Presbyterian Congregation. Architect, T. R. Peacock, 76 de Salaberry. General contractors, carpentry & interior fittings, L. H. Peters Co., 10 St. Angele street. Masonry, plastering, Alex. Fackney, 107 St. Joachim. Steel, Eastern Canada Steel Works, St. Maio. Roofing, heating, plumbing, electrical work, F. Gingras, 36 St. Augustin. Painting, B. Leonard, 53 St. John street. Excavating started.

Regina, Sask.
College building, cost $90,339, for St. Chads. Architects, Storey & VanEgmond, 1 Credit Foncier Bldg. General contractors, R. J. Lecky & Co., Ltd., Northern Crown Bank Bldg. Three storeys. Foundations in.

St. Catharines, Ont.
Mausoleum, cost $40,000, for International Mausoleum Co., Ltd., 36 King St. E., Toronto. Cement foundation, Roman stone and reinforced concrete construction, concrete floors, marble finish, sanitary system. Work just commenced under supervision of their own engineer.

South Edmonton, Ont.
Y. W. C. A., cost $12,000, First ave. S. Architect and general contractor, R. H. Bailey, 7 Main St. N. Three storeys, 36 x 62, frame, concrete foundation. Excavating started.

Thamesville, Ont.
Church, oost $10,000, for Baptist Church Congregation. Pastor, Rev. Mr. Irwin. Mason, Prudhomme & Wardell, Chatham. Carpenter, Wm. Best, Thamesville. Other contracts not awarded yet.

Westboro, Ont.
Church, cost $7,000, for Baptist Congregation. Architects, Messrs. Abra & Richards, Sparks St., Ottawa. General contractor, R. A. Kemp, 149 1st Ave., Ottawa. Wire cut brick construction, stone and concrete foundation. Provision made for Sunday School and library.

Wingham, Ont.
Armory, cost $11,000, planned by Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractor, James Mills, Kincardine, Ont.

Winnipeg, Man.
New wing, Balmoral Lodge, cost $8,000, for Salvation Army, Toronto, Ont. Architect, Major Miller, Salvation Army. General contractor, A. McBain, Winnipeg. Stone foundation, brick construction.

Business Buildings and Industial Plants

Abbotsford, B.C.
Powder factory contemplated for Dominion Powder Co. Manager, Mr. Israels. Plant will consist of ten concrete buildings. Site is being cleared and plans will be prepared.

Brantford, Ont.
66 ft. addition to foundry, for Hartley Foundry Co., Canal Road. Plans drawn.

Factory planned for Watson-Smith Co., Ltd., 161 Geary ave., Toronto. Woodworking, wire screens, etc. Ratepayers granted bonus of $20,000. Building to be erected this fall, 50,000 sq. ft.

Caledonia, Ont.
Bank building contemplated by Union Bank, head office, Toronto. Plans will be prepared.

Calgary, Alta.
Laundry, cost $100,000, planned for Ontario Steam Laundry Co., 5th ave. and 2nd street. Proprietor, Christie Bros. Architect, D. S. McIlroy, 118a 8th ave. west. Tenders called shortly.

Charlotte, P.E.I.
Rolled oats plant, cost $150,000, P.E.I. Cereal Co. contemplate erecting a concrete mill with daily capacity of not less than 300 bbls., concrete grain elevator with storage capacity of 200,000 to 300,000 bushels, concrete dock, abutment 150 ft. long by 75 to 100 ft. wide, also power house and cooperage. Mill to be in operation before end of 1914. City Council recommended that at next session of legislature (about February or March, 1914), authority be asked for the granting to the company free site, exemption from taxation and free water for ten years.

Ford City, Ont.
Bank building, Sandwich St. E., for Merchants Bank, Montreal, Que. Architects, Hoyle & Davis, 80 St. Francois Xavier street, Montreal, Que. Two storeys, cement and brick foundation, pressed brick construction. Plans in progress.

Hamilton, Ont.
Warehouse, cost $40,000, Caroline N., for Hamilton Importing Co., King Wm. St. Architects, Watt & Blackwell, Lister Chambers. Five storeys, reinforced concrete foundation. Contracts will not be awarded for a short time.

London, Ont.
Hardware warehouse, York St., for James Cowan & Co., 127 Dundas Street. Architect, J. Vicar Munro, Bank of Toronto Chambers. 3½-storeys, 50 x 150, white brick construction, brick foundation. Plans in progress.

Hotel and store, cost $15,000, Dundas, for Lloyd Estate, Avey & Dromgole, Merchants Bank Bldg. Tenders received by architect, J. Vicar Munro, Bank of Toronto Chambers, until Aug. 26th. 4-storeys, 15 x 45, white brick construction, brick foundation. Telephone and annunciator system.

Medicine Hat, Alta.
Warehouse, cost $3,500, Main street, planned for Chas. Pingle, 526 Montreal St. Architects, Scanlon & Hull, Main street. One storey, 30 x 50, frame construction, cement foundation.

Melville, Sask.
Alterations to hotel, cost $10,000, for T. Benwell, Waverley Hotel. Plans drawn.

Montreal, Que.
Offices, Notre Dame near Place d'Armes, contemplated for Jos. Versaille, Banque National Bldg. Architect not decided. Building will not be started till the present Versailles building is completed. Ten storeys.

Lumber warehouse, cost $25,000, Outremont (Durocher) for Seaman Kent Co., 970 Durocher. Owner undecided whether they will call for tenders or do work by day labor. Two storeys, 100 x 135, concrete foundation, brick construction. Plans drawn.

Factory and office contemplated by the International Braid Co. of Canada, Ltd., c/o Mr. W. L. Bond, Guardian Bldg. will open offices on Aqueduct street shortly and will build in about a year.

Branch bank, cost $25,000,, Church and Verdun, planned for Merchants Bank, 205 St. James St., Montreal. Architects, Hogle & Davis, 80 St. Francois Xavier, Montreal. Site purchased. Two storeys, concrete foundation, stone or brick construction.

Wire and rolling mill, Victoria St., Emard Ward, contemplated for Canadian Tube & Iron Co., Ltd., Victoria St. Emard Ward. Manager, Mr. Derrick. Plans not yet drawn. Machinery required.

Niagara Falls, Ont.
Business block, cost $20,000, for W. J. Manuel, Baker, Niagara Falls South. Architect, E. D. Pett. Electric lighting, store fixtures and fronts, plate glass. Baker's equipment. Plans in progress.

Ice and cold storage building, cost $50,000, contemplated for Frank Douglas & Henry Campagne, Victoria avenue.

Oakville, Ont.
Paint factory for Jas. Langmuir & Co., 1372 Bathurst St., Toronto. Company has purchased site and exemptions have been granted by ratepayers. Plans will be prepared.

Port Arthur, Ont.
Office building, cost $45,000, for Molsons Bank, St. James St., Montreal. Architects, Turner & Carloss, 116 Board of Trade Bldg., Montreal. Three stys., concrete foundation, Indiana stone, unglazed buff brick and terra cotta construction. Plans in progress.

Prince Rupert, B.C.
Hotel, cost $1,000,000, for G. T. P. Ry., Montreal. Hotel Manager, F. W. Bergman, Ottawa, Ont. Architect, F. M. Rattenburg, 621 Sayward Bldg., Victoria. 10-storeys, with two annexes, each six stys., fireproof construction, terra cotta and facing brick, lounging room, 58 x 62, palm room, 104 x 42, dining hall, 104 x 52, lobby, 52 x 62, 600 rooms. Excavation started. Tenders to be called shortly.

Regina, Sask.
Hotel, cost $1,000,000, for G. T. P. Ry. Co. Architects, Ross & MacDonald, Belmont street, Montreal. General contractors, Lyall Mitchell Co., Union Depot, Winnipeg. Nine storeys, 160 x 160, General contractor will receive tenders for various trades. Foundations will be put in this fall. Steel work erected during winter and building completed next spring.

St. John, N.B.
Remodelling office building, cost $35,000, cor. Germain and King, for C. P. R. Assistant Supt., H. C. Grout, C. P. R., King street. Architect, F. Neil Brodie, 42 Princess. One storey addition, pressed brick construction. Plans in progress.

Sarnia, Ont.
G. T. R. Co. intend to build at once elevator at Point Edward to replace one destroyed by fire July 7th.

Sault Ste. Marie, Ont.
Two stores and residences, cost $12,000 Queen street, for S. W. Fawcett, 145 Church street. Architects, Moran & Mc-

Road, Queen street. Basement, F. J. [illegible]. Two storeys, 27½ x 60, structural steel and pressed brick construction. Plans in progress.

Swastika, Ont.

Stamp mill, cost $100,000, planned. C. A. Foster Company contemplates installing complete permanent plant.

Terrebonne, Que.

Tile plant, cost $18,000, contemplated for Montreal Concrete Works Co., Ltd., 225 St. James street, Montreal. Machinery required.

Toronto, Ont.

Addition to factory, cost $4,000, planned by Conduits, Ltd., Don Esplanade. Architects, Bond & Smith, 19 Wellington St. W. 30 x 48, steel and brick construction. Tenders in.

Furniture warehouse, Chestnut street, contemplated. Architects, Designing & Draughting, 36 Toronto street. Four storeys, 50 x 120, wood construction, 12 in. by 16 in. by 18 in. beams Georgia pine.

Toronto, Ont.

Garage and repair shop, cost $9,000, Winchester. Architect, L. Foulds, 21 Leader Lane. Two storeys, steel, stone and brick construction, concrete foundation. 100 x 60. Sketches drawn.

Walkerville, Ont.

Store and flat, cost $6,000, Lincoln Road, for Fred Laforet. Architects, Smith & Walker, Excise Bldg. Tenders received by owner until Sept. 1st. Two storeys, 36 x 40, brick foundation and construction.

Welland, Ont.

Business block contemplated by Hugh A. Rose. Plans in progress.

Windsor, Ont.

Store and apartments, cost $5,000, Mercer & Brant. Tenders received by Architects, Atchison & Adams, until August 25th. Two storeys, 37½ x 26, brick construction, cement foundation.

Ice plant, cost $20,000, contemplated. Interested, David Brown, c/o Peoples Ice Co., Detroit, Mich.

CONTRACTS AWARDED

Berlin, Ont.

Shoe factory, cost $26,000, for Gourlay & Fogelbury. General contractors, P. H. Secord & Sons, Brantford. Three stys., 150 x 40.

Brantford, Ont.

Sporting goods factory, cost $15,000, for A. J. Reach Co. Architect, L. D. Barber. General contractors, Schultz Bros. Co., Ltd. Two storeys, 147 x 46.

Copper Cliff, Ont.

Hardware store, cost $7,500, for Cochrane Hardware Co., Ltd., Sudbury. Architect, W. Workman, Sudbury. General contractors, Gustiano & Sichetto. Two storeys, 80 x 35, red brick construction, stone foundation. Excavating started.

Edmonton, Alta.

Hotel, cost $300,000, 2nd St. and Jasper Ave., for Empire Hotel Co., Ltd., c/o Geo. Brown, Alexander Block. Architect, James Henderson, 42 Jasper Ave. W. General contractor, Jas. Apprentice, 2nd St. Iron and steel, Man. Bridge & Iron Works, Winnipeg. Roofing, McDermid Roofing Co., 1285 5th St. Heating, Huber Bros., 547 2nd St. Plumbing, Bowcett, Dean & Roberts, 7 College Ave. Electric, Burnham Frith Co., Rice street. Four storeys, 150 x 150.

Alterations to hotel, cost $25,000, Jasper Ave. W., for Robt. McDonald, Yale Hotel, Jasper Ave. Architect, Magoon & MacDonald, Tegler Block. General contractors, Read, MacDonald & Brewster, Tegler Block. Iron and steel, Man. Bridge & Iron Works, Winnipeg. Roofing, Mr. Huber, Windsor Hotel. Heating and plumbing, Edmonton Metal Co. Electric, Purdy & Anderson. Three storeys, 100 x 150, fire escapes.

Warehouse, cost $120,000, 4th street, for Canadian Consolidated Rubber Co., 4th street. General contractors, Canadian Stewart Co., McDougall street.

Store and offices, cost $150,000, 1st Ave., for R. Tegler, Tegler Block. Architects, general contractors and carpenters, G. H. Archibald & Co., 827 Union Bank Bldg. Heating, The Standard Plumbing Co., Athabasca Ave. Mason, Stoba & Wheatley, 10th St. and McKenzie Ave. Steel, Trussed Concrete Steel Co., Walkerville, Ont. Roofing, Charlebois & Edwards, 834 Jasper Ave. E. Electric Burnham Elec. Co., McDougall Ave. Interior Fittings, Cushing Bros., Elizabeth street. Eight storeys, 80 x 100. One elevator.

Fort William, Ont.

Grain drying plant, cost $8,000, Athabasca, for Guy Elevator Co., Graham and Horne Block. Architect and builder, S. J. McQueen. 55 ft., 12 x25, reinforced concrete construction, cement foundation.

Hamilton, Ont.

Storage building, cost $30,000, for Canadian Colored Cotton Mill Ltd., 352 McNab St. N. Architect, Stewart McPhie Bank of Hamilton Bldg. Carpenter, Jno. Vogan, 280 Sherman Ave. N. Roofing, J. E. Riddle & Son, Ferguson Ave. N. Painting, E. B. Turnbull, 224 King St. E.

Medicine Hat, Alta.

Business block, cost $35,000, for T. Mulligan, 613 4th Ave. Work done by day labor. Three storeys, 37 x 70, structural steel, artificial stone and red brick construction, cement foundation. Excavating started.

Cement factory, for Canada Cement Co., Hull Block. Manager, Mr. Leigh Hunt. Architects and builders, Hunt Engineering Co., Hull Block. Two stys., cement foundation, brick and structural steel construction. Foundations in.

Auto showroom, cost $3,000, Main St., for V. Ready & J. Johnston, Medicine Hat Garage. Work done by day labor. One storey, 40 x 50, frame, cement foundation, concrete floors. Excavating started.

Business block, cost $20,000, N. Railway, for Wm. Lowe, Cecil Hotel. Architects and general contractors, Deitrich & Umbrecht, Cecil Hotel. Two storeys, 50 x 50, artificial stone and brick construction. Foundations in.

Montreal, Que.

Store and residence, cost $56,000, Hampton, Notre Dame De Grace. Owner and builder, Felix Dansereau, 1211 Ontario St. E. Two storeys and basement, 22 x 64, cement foundation, brick construction. Work in various stages of progress on different houses. Foundations in.

Offices, cost $80,000, Maisonneuve (Notre Dame and First Ave), for Canadian Vickers, Ltd., 20 Bleury St. Architects, T. Pringle & Sons, Coristine Bldg. General contractor, E. G. M. Cape, New Birks Bldg. Three storeys and basement, 50 x 120, concrete foundation, Montreal stone, fireproof and brick construction.

Department store, cost $35,000, Beaubien. Architects and general contractors, Cycloops Constr. Co., In Trust, 96 Notre Dame W. Four storeys, 40 x 114, stone foundation, steel and solid brick construction, galvanized iron, store fronts and fixtures. Foundations in.

Office building, St. Urbain, for M. I. H. & P. Co., Power Bldg., Craig St. General contractors, masons and carpenters, P. Lyall & Sons Construction Co., Ltd., Transportation Bldg. Iron, Arch. Iron Works, 157 Prince St. Plastering, R. D. Clark & Sons, 26 Lincoln Ave. Painting and glazing, C. A. Sharpe, 234 Craig E. Heating and plumbing, The Garth Co., 28 Craig W. Electric. Power Co. Kaleimined work, Douglas Bros., 19 St. Maurice. Six storeys, 95 x 91.

Repairs to restaurant, cost $20,000, Clarke and St. Catherine Sts., for North Eastern Lunch Co., 21 St. Catherine W. General contractor and carpenter, D. F. Sheehy, 16 St. Cecile. Mason, Thos. Wand, 326 Laval Ave. Plastering, J. C. Horton, 122 Chatham. Painting, H. Daniels, 139 Fulford. Store fronts and fixtures.

Wholesale grocery warehouse, cost $45,000, 1170 St. Lawrence Blvd., for P. Adelstein, 1173 St. Lawrence Blvd. General contractors, masons and carpenters, Gilbert Demers & Sairazin, 861 St. Lawrence Blvd. Roofing, heating, plumbing and electric, Reck Ouimet, 93 Vitre W. Plastering and painting not let. Four storeys, 33 x 70. Excavating done.

Office building, cost $600,000, St. Catherine and Peel, for Island Land Co., 80 St. Francois Xavier. Architect, H. C. Stone, 84 St. Francois Xavier. General contractors, Norcross Bros., New Birks Bldg. Plastering, D. J. Burcan, New York. Painting not let. Ten storeys, 125 x 125. Foundations in.

Office building, Hospital and St. John, for Robt. Reford Co., 25 St. Sacrement. Architects, Ross & MacDonald, 1 Belmont. General contractors, P. Lyall & Sons Construction Co., Ltd., Transportation Bldg. Heating and plumbing, McKnight & Blackadder, 91 Inspector. Foundations in.

Stove foundry, etc., cost $60,000, St. Laurent, for Canada Stove & Furniture Co., Ltd., St. Catherine and Delorimier St., Montreal. Architect, W. A. Mahoney, Guelph, Ont. General contractors, The James Shearer Co., Ltd., 225 St. Patrick. Roofing, Hickey & Aubut, 93 Dominion. Painting, Alex. Craig, 41 Jurors.

Ottawa, Ont.

Addition to store and stables, cost $10,000, Lewis, for Matthews Laing Co., Ltd., Hull and Ottawa. Architect, W. E. Noffke, Central Chambers, Elgin St. Masons, Holbrook & Sutherland, 480 MacLaren. Carpenters, Smith Bros., 448 McLeod. Plumbing and heating, Currie

& Livock, 104 Bank St. Iron work, McFarlane & Douglas, 250 Slater.

Preston, Ont.
Bank building for Merchants Bank of Canada, H. O., Montreal. Architects, Hogle & Davis, 80 St. Francois Xavier St., Montreal. General contractors, P. H. Secord & Sons, Brantford.

Quebec, Que.
Store and warehouse, cost $15,000, for Hubert Moisan, 297 St. Joseph. Architect, general contractor, mason and carpenter, Ed. Gingras, 297 St. Joseph. Iron and steel, Eastern Canada Steel & Iron Co., St. Malo. Roofing, Nap Barbeau, 36 Bridge St. Painting, Gauthier & Frere, 292 St. Joseph. Heating not yet awarded. Three storeys, 30 x 48, stone foundation, reinforced concrete and Scotch brick construction.

St. John, N.B.
Remodelling Bank of Montreal, cor. King and Prince Wiliam. Manager, Mr. Bancroft. Architects, Peden & McLaren, 20 St. Alexis St., Montreal. General contractors, Anglins, Ltd., Montreal. Inside of building to be entirely remodelled with modern bank fixtures. Work to start at once.

St. Johns, Que.
Factory for The Canadian Clarendon Marble Co., Ltd., McGill Bldg., Montreal. General contractor, Pierre Trahan, St. Jean St. Machinery required.

Simcoe, Ont.
Store, cost $6,000, for R. W. Wallace. General contractor, R. E. Gunton. Excavating started.

Toronton, Ont.
One pair stores and residences, cost $8,000, Danforth. General contractor and owner, J. W. Yonge, 21 Danforth Ave. Owner will sublet. Three storeys, 42 x 80, steel and brick construction, brick foundation.

Vancouver, B.C.
Departmental store, for Hudson's Bay Co. Architects, Burke, Horwood & White, 28 Toronto St., Toronto. Engineer, P. R. Moses, New York. General contractors, Bar & Anderson, 1060 Homer street. Excavating started.

Walkerton, Ont.
Sash and door factory, cost $7,000. Architects and builders, R. Truax & Son. Dry kiln about completed. Main building to be started in September. One storey, 105 x 90, brick, cement foundation.

Winnipeg, Man.
Warehouse, Pacific Ave., for A. MacDonald, Vaughan St. Architect, H. A. Irish, Kennedy Bldg. General contractors, Fred Lewis Co., Somerset Bldg. Refrigeration plant will be installed.

Residences

Ford City, Ont.
Residence, cost $6,000, Sandwich St. E., for Theo. Pratt, Walkerville. Cement and brick foundation, pressed brick construction. Plans in progress.

London, Ont.
Apartment house, cost $15,000, Dundas, for J. F. Tennant, 425 Quebec St. Tenders received by Architects, Wyatt & Blackwell, Bank of Toronto Bldg. Concrete and stone foundation, red pressed brick construction.

Residence, cost $32,000, Regent St., for N. McVicar, 984 Richmond St. 2½-stys., 26 x 31, red brick construction, cement foundation. Plans drawn.

Montreal, Que.
Apartment house, cost $250,000, for an American Syndicate. Architect, C. A. Mitchell, 58 Beaver Hall Hill. Concrete foundation, stone and brick construction. Plans in progress.

Apartment house, cost $100,000, Westmount, for O. Lamoureux, 15 St. James St., Montreal. Architect, R. Charbonneau, 15 St. James. Three storeys. Sketches in progress.

Ottawa, Ont.
Residence, cost $8,000, Clemow, for M. M. O'Connell, 212 Gloucester street. Architect, A. L. Weeks, Sparks St. 2½-storeys, 29 x 40, brick veneer construction, stone foundation. Plans drawn.

Residence, cost $10,000, Powell, for John Preston, Stewart St. Architect, A. L. Weeks, Sparks St. 2½storeys, 32 x 40, brick construction, stone and concrete foundation. Plans drawn.

Toronto, Ont.
Apartments, Beverley and D'Arcy, for J. Kennedy, 139 Beverley St. Architect, N. G. Begg, Cosgrave Bldg. Tenders received by owner for masonry and carpentry work at once. Not ready yet for tenders on heating, wiring and plumbing. 2½-storeys, Milton brick construction, stone foundation, shingle.

Residence, cost $8,000, Cedarvale, planned for A. G. Piper, c/o Architect, J. M. Lyle, 14 Leader Lane, who will receive tenders about August 22. Brick foundation, stone and brick construction.

Walkerville, Ont.
Six 7 family flates, cost $5,000 each, Devonshire Road. Owners, Walkerville Land & Building Co. Tenders received by Architects, Smith & Walker, Excise Bldg., until September 1st. Two storeys, 45 x 24, brick foundation, frame and pressed brick construction.

CONTRACTS AWARDED

Calgary, Alta.
Residence, cost $6,000, Elbow Park. Owner and general contractor, W. S. McDonald, Box 1157. Two storeys, 24 x 38. Foundations in.

Fort William, Ont.
Residence, cost $5,500, Marks St., for R. Sproule. Architects, Hood & Scott. General contractor, R. E. Wright, Victoria Ave. 2½-storeys, 32 x 40.

Hamilton, Ont.
Residence, cost $7,000, Aberdeen Ave., for C. H. Bampfylde, Bay St. S. General contractor, P. Paterson, 174 Stinson street. Stone foundation, pressed brick construction.

Montreal, Que.
Residence, cost $25,000, Pine Ave., for J. A. Trudeau, 22 Notre Dame E. Architect, W. A. Gagnon, 1002 New Birks Bldg. General contractors and masons, Jno. Quinlan & Co., 4414 St. Catherine W. Carpenter, Alp. Bonin, 194 Ada Other contracts not yet awarded. Foundations in.

Semi-detached residence, cost $15,000, Westmount, for H. E. Plant, 112 St. Matthew street. Architect, general contractor and mason, Jno. Quinlan, 4414 St. Catherine W. Carpenter, D. M. Long, rear 39 Windsor St. Heating and plumbing, W. J. Graham, 85 Cathcart Street.

Flats, cost $12,000, Verdun (1st Ave. between Verdun and Wellington), for Mr. Lalonde, 1st Ave., or c/o Builders. Builders, Lalonde & D. Lanthier, 1332 Wellington. Three storeys, 75 x 55, cement foundation, brick construction.

Residence, cost $12,000, Cedar Ave., for C. B. Robin, 16 The Marlborough. Architects, Saxe & Archibald, 59 Beaver Hall Hill. Carpenter, A. K. Hutchison, 4404 St. Catherine W. Remainder of contracts not yet awarded.

Addition and alterations to residence, cost $7,000, 28 Ontario Ave., for Percy Cowans, 95 Notre Dame W. Architects, E. & W. S. Maxwell, 6 Beaver Hall Sq. Mason and brick, Reid, McGregor & Reid, 14 Guy Block. Excavating started.

Four flats, cost $8,000, Girouard. Owner and builder, Holmes Labelle, 330 Seigneurs. Two storeys, 78 x 45, cement foundation, brick construction. Excavating done.

Residence, cost $50,000, Westmount (Roslyn Ave.), for Geo. Rabinovitch, 107 St. James St. Landscape architect, F. G. Todd, New Birks Bldg. Architects, Saxe & Archibald, 59 Beaver Hall Hill. Carpenters, Favreau & Corbeau, 12 Erie. Roofing, Douglas Bros., 19 St. Maurice. Plastering, McNulty Bros., 182 Mountain. Painting, Castle & Son, 568 St. Catherine W. Electric, Henry Morgan, 1 Beaver Hall Hill. Marble and tile, Sanitary Tiling Co., 136 Bleury St. 2½-storeys and basement, 23 x 55.

Residence, cost $25,000, Westmount (Aberdeen), for R. C. Patton, 421 Mackty. Architects, Cox & Ames, 78 Crescent. General contractor, D. M. Long, rear 39 Windsor. Mason and carpenter, General contractor. Heating and plumbing, J. A. Gordon, 301 St. Antoine. Roofing, plastering, painting and electric work let this week.

Flats, cost $12,000, Verdun (1st Ave). Architect and builder, E. Lalande, St. Benoit, Que. Four 3-storey, 73 x 51, brick construction, concrete foundation.

Addition to residence, cost $16,000, Cote des Neiges, for Carl Riordan, "Amherst House," 374 Cote des Neiges Rd. Architects, MacVicar & Heriot, 104 Union Ave. General contractor, E. B. Evans, 75 St. Denis street. Addition 2½-storeys, 23 x 14, stone foundation, brick construction.

Three residences, cost $22,000, Outremont (Bloomfield), for A. Cerbin, 1149 Van Horne Ave. Architects, Viau & Venne, 76 St. Gabriel St. General contractor, carpenter and plastering, Owner. Roofing, heating and plumbing, Jos. St. Amand, 109 Laurier Ave. W. Electric lighting will be let shortly. Three stys., 20 x 77.

Montreal West, Que.
Residence, cost $11,200, Caston, for J. R. Colby. Architects, Peden & McLaren, 20 St. Alexis. General contractor, J. J. Kirkpatrick, Montreal W. 2½-

(Continued on page 92)

Tenders and For Sale Department

THE PAS, MANITOBA

Notice to Contractors

Sealed tenders, registered and endorsed on the envelope, "Tender for (tender bidding on)" and addressed to H. H. Elliott, M.D., Sec.-Treas. of the Town of The Pas, Man., will be received up to 6 p.m. **August 27th, 1913**, for the construction of the following works:

Tender A—Construction of Sedimentation Basin.

Tender B—Foundations for Power House.

Gravel 75c f.o.b. The Pas, Man.

Marked cheque for five per cent. (5 p.c.) of the amount of the bid must accompany each tender, or in lieu of the said cheque, the tenderer may furnish the bond of an approved surety company.

Plans, specifications and instructions may be seen at the offices of the Consulting Engineers, Saskatoon, or at the Resident Engineer's office at The Pas, Man., or plans and specifications will be given or forwarded on a deposit of Twenty ($20) Dollars—the deposit cheque to be returned if the plans and specifications are returned with the tender.

H. H. ELLIOTT, M.D., Sec.-Treas.,
The Pas, Man.

MURPHY & UNDERWOOD,
Consulting Engineers,
34 Ross Bldg., Saskatoon, Sask.

Sealed tenders addressed to the undersigned and endorsed "Tender for Jetty and Dredging at the North Arm of the Fraser River, B.C., will be received at this office until 4.00 p.m., on **Tuesday, September 30, 1913**, for the construction of Jetty and Dredging at the North Arm of the Fraser River, B.C.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department and at the offices of C. C. Worsfold, Esq., District Engineer, New Westminster, B.C.; W. Z. Earle, Esq., District Engineer, Winnipeg, Man.; J. S. MacLachlan, Esq., District Engineer, Victoria, B.C.; J. L. Michaud, Esq., District Engineer, Post Office Building, Montreal, P.Q.; J. G. Sing, Esq., District Engineer, Confederation Life Building, Toronto, Ont., and on application to the Postmaster at Vancouver, B.C.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to five per cent. (5 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, August 18, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—45074. 34-35

Main Drainage Works

Sealed tenders addressed to the Chairman of the Board of Control, City Hall, Toronto, will be received by registered post only, up to noon of **Tuesday, August 26th, 1913**, for the supply and erection of three motor-driven Centrifugal Sewage Pumps, automatically controlled.

Plans, specifications, forms of tender and other information may be obtained at the office of the Commissioner of Works, City Hall, Toronto.

H. C. HOCKEN, Mayor.
Chairman of Board of Control.

City Hall,
August 9th, 1913. 34

Department of Railways and Canals, Canada

SOULANGES CANAL

Rebuilding Head of Guard Pier at Cascades Point, Que.

Notice to Contractors

Sealed tenders, addressed to the undersigned and marked "Tender for rebuilding head of Guard Pier, Lower Entrance, Soulanges Canal," will be received at this office, until noon, on **Friday, August 29th, 1913.**

Plans, specifications and form of contract to be entered into can be seen on or after this date at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Superintending Engineer, Quebec Canals, Birks Building, Phillips Square, Montreal.

Parties tendering will be required to accept the fair wages schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached tht actual signature, the nature of the occupation and place of residence of each member of the firm.

An accepted bank cheque on a chartered bank of Canada for the sum of $5,000 made payable to the order of the Minister of Railways and Canals, must accompany each tender, which sum will be forfeited if the party tendering declines entering into a contract for the work, at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,
Asst. Deputy Minister and Secretary.

Department of Railways and Canals,
Ottawa, 9th August, 1913.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.—46228. 33-34

Tenders for Concrete Bridge

Tenders marked "Tender for Bridge," a dressed to the County Clerk, Lindsay, Ont., wil be received until **Saturday, August 30, 1913**, fo the erection and completion of a reinforced Co crete Bridge and relative work across the Na rows of Mud Lake in the Township of Carde in the County of Victoria, according to plans a specifications prepared by Mr. George Smit County Engineer, all to be finished not lat than November 1st next.

The steel for reinforcement will be purchase and supplied by the Municipalities interested a at their expense, tenders will not, therefore, in clude a price for that material.

Plans and specifications may be seen at th office of the County Clerk, Court House, Lind say, or copies supplied on application, on an after Wednesday, August 20th, 1913.

The lowest or any tender not necessarily accepted.

A. E. BOTTUM,
Chairman of Committee

Lindsay, Aug. 16th, 1913. 34

Tenders Wanted

Sealed tenders will be received up to noon on the **16th day of September, 1913**, by the undersigned at Cayuga, Ontario, for the construction of twenty-six and one-half miles of stone macadam road in the County of Haldimand.

The work will be let in three separate and distinct contracts, not necessarily to the same individual.

Tenderers are required to examine the localities of the work and are required to be present at the opening of the tenders at 2 p.m. on Wednesday, the 17th day of September, 1913.

Plans and specifications may be seen at the office of the County Engineers, Messrs. Jackson & Kyd, Dunnville, or may be had from them on the payment of $10, which sum will be refunded on return of the documents.

Lowest or any tender not necessarily accepted.

T. A. SNIDER, K.C., County Clerk,
County of Haldimand,
32-37 Cayuga, Ont.

Special Notice

Every man who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works are advertised.

Send along your plans when asking for tenders put a line in your advertisement to that effect.

No extra charge is made for filing plans at one or all four offices.

Contract Record and Engineering Review

Montreal—119 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—429 Pender Street.

TOWN OF WALKERVILLE

Tenders for Sewers

Sealed tenders will be received by registered post, addressed to the undersigned up to **Tuesday, the second day of September, 1913, at noon,** for the construction of sewers on the following streets and alleys in the Town of Walkerville.

1. Sewer on Lincoln Road, North of Lots 377 and 454, Southerly to Lots 412-417.
2. Sewer on Ontario St., from Kildare to Argyle Road.
3. Sewer in Alley West of Argyle, between Ontario Street and Devonshire Court.
4. Sewer in Alley East of Kildare Road, between Ontario and Devonshire Court.
5. Sewer on Kildare Road, South of Ontario, from Lot 134 to 149.
6. Sewer in Alley between Devonshire Court and Ottawa Street, from Kildare East to Argyle.
7. Sewer from West Side Kildare Road, Easterly in Alley, from Iroquois Street to Argyle Road.
8. Sewer in Alley, South of Iroquois St., from Windemere Road to Kildare and thence to Argyle.
9. Sewer on Kildare Road, South of Huron, from present terminus to Ontario Street.
10. Sewer in Alley, East Side Kildare Road, between Huron and Ontario Streets.

Plans and specifications may be seen on application to Owen McKay, C.E., Walkerville.

Tenders must be accompanied by a marked cheque, payable to the Town Treasurer, equal to 2½ per cent. of the amount thereof.

Should any party whose tender is accepted, fail to execute the necessary contract and bond for the due fulfilment of the same, his deposit will be forfeited to the Town.

Deposits of unsuccessful tenderers will be returned.

The lowest tender not necessarily accepted.

The names of two responsible persons, willing to act as sureties must accompany each tender.

CECIL H. ROBINSON,
Town Clerk.
Walkerville, Ont.
August 14th, 1913. 34

Board of Education

Sealed tenders, whole or separate, addressed to the Secretary-Treasurer of the Board, will be received until

Friday Noon, August 29th, 1913,

for the several trades required in the erection of a

New School Building on Humewood Avenue,
and for
Heating and Ventilating, Plumbing and Electrical Work, Deer Park School
and for
Moving a Pair of Houses on Leslie Street,
also for
Sale of Old Houses on St. Clarens and Grange Avenues

Specifications may be seen, and all information obtained at the office of the Superintendent of Buildings, City Hall. Each tender must be accompanied with an accepted bank check for five per cent. of the amount of tender, or its equivalent in cash. Tenders must be in the hands of the Secretary-Treasurer at his office in the City Hall not later than 12 o'clock noon on the day named, after which no tender will be received. The lowest or any tender will not necessarily be accepted.

W. O. McTAGGART, Chairman of Committee.
W. C. WILKINSON, Secretary-Treasurer. 34

CITY OF LONDON

Tenders for Steelwork

Sealed Proposals addressed to the "Chairman and Members No. 2 Committee" will be received at the office of the City Clerk up to 5 p.m. on **Thursday, the 11th day of September, 1913,** for the supply and erection of three 130 feet spans rivetted truss steel highway bridge over the River Thames, the substructure for which is already under construction.

Plans, specifications and all particulars can be had at the office of the City Engineer.

No tenders will be considered unless accompanied by a deposit cheque for 5 per cent. amount of the bid.

The lowest or any tender not necessarily accepted.

B. W. BENNETT, Chairman No. 2 Committee.
WM. N. ASHPLANT, City Engineer. 34-35

TOWNSHIP OF BRANTFORD

Cement Sidewalks

Sealed tenders will be received up to **Saturday, the 30th inst.** at the office of the Township Clerk, County Buildings, Brantford, for the construction of 7810 linear feet of four-foot cement sidewalk.

Tenderers are expected to look over the site of the work before putting in their bids. Plans and specifications may be seen at the office of the undersigned.

Tenders must be accompanied by marked cheque for $300, payable to the Township Treasurer.

Lowest or any tender not necessarily accepted.

ALAN MAIR JACKSON,
Township Engineer,
34 Temple Bldg., Brantford, Ont.

For Sale

One Koehring Concrete Paving Mixer, capacity 14 cu. ft.

One Austin Cube Concrete Paving Mixer, capacity 9 cu. ft.

One 20 h.p. Case Traction Engine.

All of above used only a few months and in perfect condition.

Apply Box 831, Contract Record, Toronto, Ont. 29-t.f.

Some Good Machines

Buckeye Trenching Machine, 12 in. x 4½ ft, A1 ... ... $700

Buckeye Trenching Machine, 27 in. x 8 ft.; just through shops; as good as new $2,500

Parsons Trenching Machine, 2 ft. x 5 ft. to 20 ft. deep. A1 ... ... $3,500

Thew No. 0 Steam Shovel. Overhauled by Thew Manufacturers last year. A1 ... ... $2,800

TRACTION ENGINE

Located in Canada, 30 H.P.

undermounted, double Avery machine, coal burner with rear mounted Steel Water Tank. Also an Avery Steel Water Tank on truck with pump. Cost, new, $3,575. This is in first-class condition $1,800

WHAT DO YOU NEED IN SECOND-HAND EQUIPMENT?
TRY US!

WILLIS SHAW MACHINERY CO.
La Salle Street, Chicago. Ill.

Situations Wanted

Sand, lime and brick engineer, expert in all silicate products with 18 years experience in Germany, England and the U. S. A., with all machinery and systems, wants to get acquainted with interested parties. Fritz Klaeck, Alexandria, Ont. 33-34

Residences

(Continued from page 89)

storeys and basement, cement foundation, brick construction.

Toronto, Ont.

One pair detached residences, cost $10,000, Howard Park, for W. V. Dixon, 259½ Yonge St. Tenders in carpentry being done by day labor. Brick construction, concrete foundation, shingle. Excavating started.

North Toronto, Ont.

Residence, cost $30,000, Snowdon, for H. Acton, Fleming, c/o Architects, Allan, George & Moorehouse, 67 Victoria St .Mason, Thomas Bros., Dupont St. Roofing, W. Davies & Co., 172 McPherson Ave. Plastering, Hanna & Nelson, 273 Rusholme Road. Painting, Cantwell & Wood, 759 Yonge St. Heating and plumbing, Read-Frankland, Ltd., 553 Bloor W. Electric, E. G. W. Salisbury,

---

Second Hand
Model 41 Marion Steam Shovel
FOR SALE
At A Very Reasonable Figure

We have to offer for immediate delivery, subject to inspection and prior sale a Model 41 Marion Latest Type Steam Shovel, equipped with 1½ cubic yard dipper; on railroad trucks, complete.

This shovel is not one year old and has been operated very little Shovel is in fine condition and is offered at a very low figure.

Full details, prints and specifications sent on request.

Apply Box 862 Contract Record, Toronto, Ont.
34-35

18 Fenwick Ave. Metal casement, Crittal Casement Co., 67 Victoria. Steel and hollow tile construction, stone foundation.

Regina, Sask.
Residence, cost $7,000, Montreal. Owner and general contractor, D. A. Morrison, 2130 Broad St. Brick construction and foundation, slate roofing.

Residence, cost $10,000, Leopold Crescent. Owner and general contractor, J. W. G. Mills, 2331 Quebec St. 2½-stys., brick construction and foundation.

Stanbridge, East Que.
Residence, cost $25,000, for C. S. Campbell, Merchants Bank. Builders, Laurentian Constr. Co., 103 St. Francois Xavier. Four storeys, cement foundation, reinforced concrete construction. Excavating started.

Power Plants, Electricity and Telephones

Brantford, Ont.
Electric sub-station, cost $5,426, for Hydro-electric Department. Architect, J. G. Ireland, 8 Commercial Chambers. General contractors, Bennett & Bowden. Two storeys, 28 x 39, brick construction, 3 transformers and switching apparatus are to be installed. These will be handled by the Ont. Hydro-electric Commission, Continental Life Bldg., Toronto.

Brockville, Ont.
Street lighting planned by Town Council. Clerk, George Dewey. Engineer-in-charge, Manager Philip. New cluster lamps on iron standards on both sides of King street.

Coquitlam, B.C.
Telephone exchange planned for B. C. Telephone Co., H. O., Vancouver. Building Supt., Mr. Johnston. Work may be done by day labor or general contract.

Hamilton, Ont.
Conduit system planned by Hydro-electric Dept. Clerk, S. H. Kent. Tenders received by Mayor, Jno. Allan, until August 28th, for conduit system for Hydro-electric. Plans, specifications, at office of Engineer, E. J. Sifton.

Melville, Sask.
Town Council contemplates doubling electrical power plant at a cost of $20,000.

Montreal, Que.
Electric lighting installation, Bonsecours Market, planned by Board of Commissioners. Sec., L. N. Senecal. Specifications, etc., at office of Supt. of Lighting Dept., City Hall. Tenders received by Secretary until noon August 21st.

Neepawa, Man.
Electrical apparatus planned by Town Council. Plans and specifications at office of Con. Engineer, W. E. Skinner, 204 Sterling Bank Bldg. Tenders will be called shortly for 2 150 h.p. boilers and a generater unit, consisting of 125 k.w. direct connected to a suitable engine.

Ottawa, Ont.
Underground services planned by Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Chief electrician, Jas. Johnson. Plans, specifications, at office of Chief Electrician, Dept. of Public Works. Tenders received by Secretary until August 22nd.

St. Catharines, Ont.
Power station, cost $6,500, 212 Welland Ave., for Niagara, St. Catharines & Toronto Rly Co. General manager, K. F. Seixas, 133 Ontario St. General contractor, Newman Bros., 75 St. Paul St., St. Catharines. One storey, stone foundation, brick construction, composition roofing.

Swastika, Ont.
C. A. Foster, Haileybury, is interested in a company which contemplates installing 7-mile telephone line, from Swastika to Foster property, taking in all mines on route. Central station will be installed at Kirkland Lake. Architect, A. Throop, Haileybury.

Miscellaneous

Hensall, Ont.
The Council will at once take up the matter of securing either new fire apparatus or new waterworks fire system. Reeve, Geo. Joynt.

Rosthern, Sask.
By-law will be voted on August 23rd to provide fire engine and equipment. Mayor, Geo. Hodson. Sec.-treas., Geo. Braden.

Business Notes

Athabasca Landing, Alta.
Business block, hotels, etc., burned. Owners, Canadian Bank of Commerce. Loss, $2,500. Athabasca Forwarding Co., warehouse, $50,000; W. H. Gashill, store, $2,500; Athabasca Hotel Co., $20,000; Braults & Veins, warehouse, $10,000; A. McLeod, store, $10,000; Duech's Hardware Co., store, $12,000; H. F. Hackett, store, $5,000; Ike Gagnon, business block, $30,000; livery barn, $6,000; Grand Union Hotel Co., hotel, $50,000; H. F. Cull, drug store, $7,000; N. Grancraux, pool room, $10,000; E. Oliver, livery barn, $40,000; Revillon's warehouse, $6,000; Athabasca Trading Co., store, $16,000; Mr. Dubord, store, $5,000.

Hamilton, Ont.
Foundry of The Canada Steel Co., Sherman Ave. N., burned. Main building totally destroyed. Loss $25,000. Completely covered by insurance. New building will be erected at once.

The Smart Turner Machine Co., Ltd., 191 Barton St. E., Hamilton, are supplying The Canadian Porcelain Co., Hamilton, with one automatic feed pump and receivers; E. D. Smith & Sons, Winona, Ont., one duplex pump; Corporation of St. Catharines, one duplex pump; National Steel Cor Co., one duplex pump; The Donnaconna Paper Co., Donnaconna, Que., one duplex pump; The Canadian Steel Foundries, Welland, Ont., one centrifugal pump; The Garden City Paper Co., St. Catharines, Ont., one centrifugal pump.

Humboldt, Sask.
Store, Main, owned by W. R. Stevenson, burned. Loss, $50,000. Three storeys. Halings Bakery, loss, $7,500, and office building of Stocket & Elliot, Main street. Loss, $20,000. Three stys.

L'Epiphanie, Que.
Sash and door factory burned. Owned by Ferland Bros. Loss, $25,000, small insurance, residence of Jos. Gauthier and Jos. Lamarch, and grocery store of Edmond Bourque also destroyed. To be rebuilt.

Montebello, Ont.
Convent and residences burned. Owners, Grey Nuns. Loss, $15,000; A. Sauriol, residence, $6,000; Adolphe Richer, restaurant, $3,000; N. Chenier, 4 residences, $6,000; Dr. H. Barolet, residence, $6,000. Owners will rebuild.

Montreal, Que.
Factory and offices burned. Owned by Jas. Cleland, die manufacturers, 16 St. George; Continental Upholstering Co., 22 St. George; F. A. McKay, iron wroks, 18 St. George; residence, 4911 Western ave., V. C. Fuller, 14 St. George. Loss, $35,000.

Offices, 317-321 Craig, owned by Can. Metropolis Realty Co., Ltd. (L. G. Bowker, 120 St. James St.), burned. Loss, $10,000. Will rebuild.

Ottawa, Ont.
Poultry and sheep buildings, owned by Exhibition Association, burned. President, T. C. Bate. Loss, $25,000. Will rebuild.

Rexton, N.B.
Hotel, owned by Gustave Sawyer. Completely destroyed by fire. Loss covered by insurance.

Sherbrooke, Que.
The Victoria Butter Factory burned. Proprietor, F. Roby. Will rebuild and require entire equipment.

Wardner, B.C.
Crows Nest Lumber Co.'s plant was completely destroyed by fire. Loss, $40,000.

Weyburn, Sask.
Store, owned by Ideal Grocery Co., 3rd Street, burned. Loss, $7,000. 2½-stys.

New Companies

Berlin Industrial Centre, Limited, has been incorporated with a capital of $40,000 to carry on business as a general land and building company, with head office at Berlin. The provisional directors are Alex Millar, H. J. Sims and W. H. Gregory, barristers, all of Berlin.

The Sebley Telephone Company, Limited, has been incorporated with a capital of $5,000 to carry on the general business of a telephone company, with head office at Newburgh. The provisional directors are C. W. Demille, Minister, T. I. Winter and H. M. Ryan, merchants, all of Newburgh.

Turbine Equipment Company, Limited, has been incorporated with a capital of $40,000 to carry on business as civil, mechanical and electrical engineers, contractors, etc., with head office at Toronto. The provisional directors are J. L. Ross, barrister, D. J. MacLean, manager, and C. J. F. Collier, law student, all of Toronto.

MacLean Daily Reports
Limited

The only systematic method yet devised for reporting BUILDING AND ENGINEERING projects from their inception to completion. Ask us for Rates and Specimen Reports.

220 King Street West - TORONTO

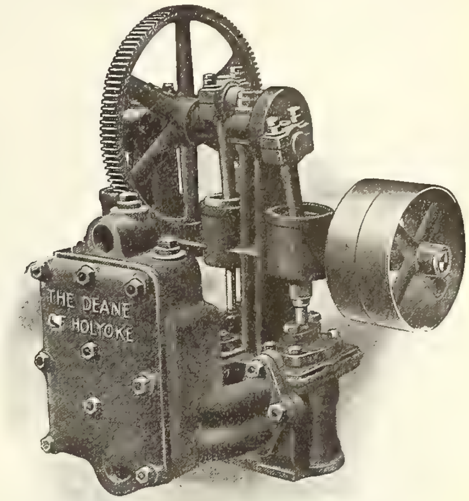
DEANE POWER PUMPS

ADMIRABLY ADAPTED FOR

HOUSE SUPPLY

BOILER FEEDING

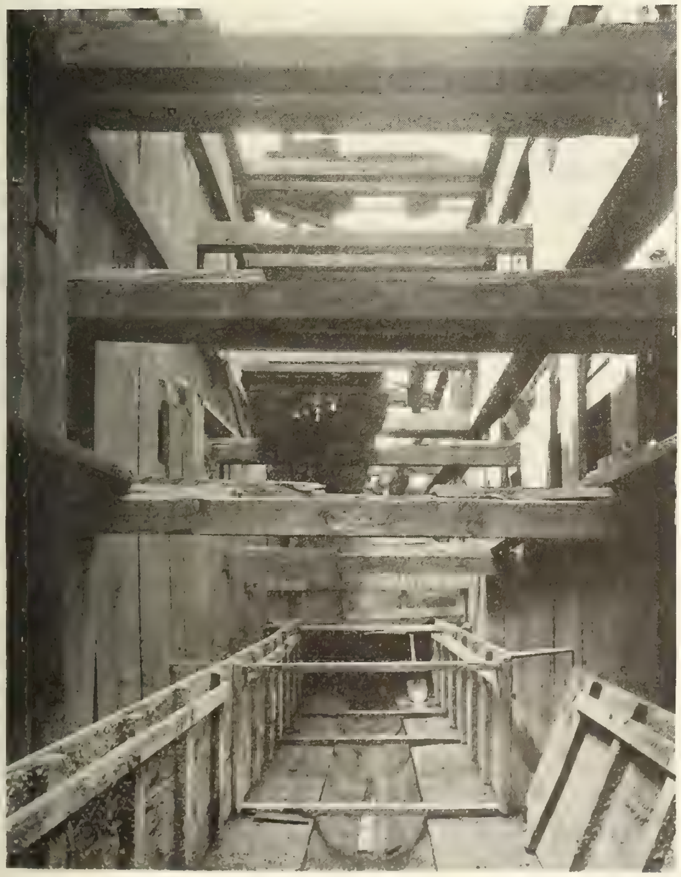
TANK SERVICE



THE JOHN McDOUGALL CALEDONIAN IRON WORKS CO., LIMITED

Works: Seigneurs & William Sts., MONTREAL.

Manufacturers of Boilers, Castings, Condensers, Elevators, Engines, Filters, Forgings, Hydraulic Machinery, Pumps, centrifugal and reciprocating, Steam Turbines, Tanks, Water Wheels, Water Works Plants.



Jennings & Ross
Limited

Engineers and Contractors
Toronto

Royal Bank Bldg. - King and Spadina
Phone Adelaide 292

Showing 35 ft. excavation on the Kingston Road Sewer—Edgewood Avenue to Woodbine Avenue.

BOILER AND STEEL PLATE WORK

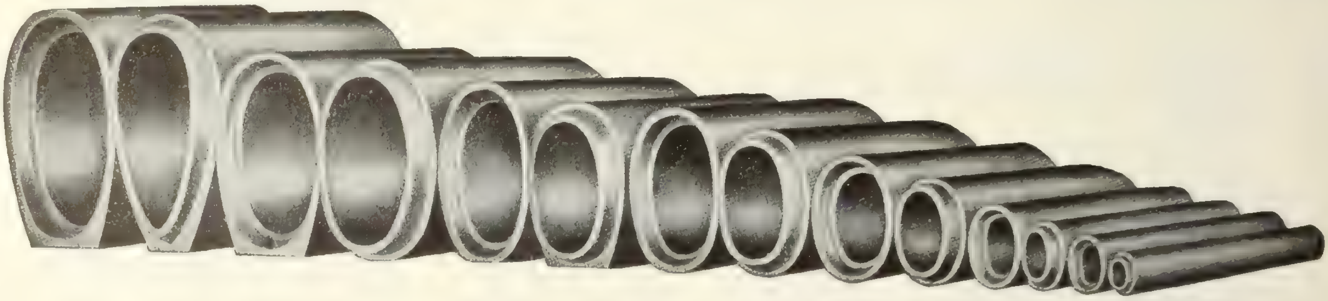
Of All Kinds

We are manufacturers of: —Boilers, Steel Tanks, Smoke Stacks, Ore Buckets, Ore Cars, Steel Flumes, Etc. Any size or style.

Hoisting Machinery a Specialty

Let us quote on your requirements. *All Work Guaranteed.*

MARSH & HENTHORN, LTD., - Belleville, Ont.



Sewers and Culverts

properly built of properly made

- Reinforced Concrete Pipe -

LAST FOREVER.

OUR MATERIAL, SYSTEM and PRODUCT have been tested and approved by EMINENT ENGINEERS. NO RUST, NO ROT, NO FROST-BREAKS, NO PRESSURE-BREAKS, NO HIGH PRICES, NO DELAYS IN PROCURING, NO TROUBLE IN HANDLING.

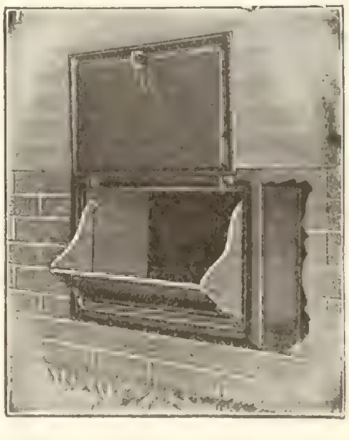
STANDARD REINFORCEMENT, or SPECIAL if required. Stock sizes 6 in. to 60 in.

Patronize Experienced and Reputable Manufacturers.

Catalogue and prices on application.

Dominion Concrete Company Ltd.

Kemptville, Ontario



EQUIP YOUR CELLAR

with one of our "Majestic" Coal Chutes which is the neatest and best equipment for any cellar. It is easily installed in either new or old houses. It permits coal, wood or vegetables to be put into the cellar without disfiguring the building in any way. And unlike a glass window it cannot be broken. The hopper can easily be removed if desired to put in very coarse coal or wood, or if a waggon chute is used. It swings back into the chute and allows the door to be closed. The door is made to lock when opened upward, and protects the wall or siding above the chute, and can be released only when closed. We make three standard sizes. There's a size that's just right for your cellar and your requirements. No. 1—22 x 16 x 13. No. 2—27 x 16 x 13. No. 3—33 x 22 x 18.

Send for our illustrated booklet, it shows and describes our full line of Coal Chutes

The Galt Stove & Furnace Co., Limited, GALT, ONT., CAN.

Toronto Representatives: Black Building Supply Co., Mail Building
Montreal Representative: E. F. Dartnell, No. 8 Beaver Hall Square
Gorman, Clancey & Grindley, Agents, Calgary and Edmonton, Alberta

The Standard of Comparison For Paving Materials

To claim that a paving or road-building material is as good as Trinidad or Bermudez asphalt is considered the strongest endorsement that can be brought forward.

But the materials for which this claim is made are usually new and untried, and year after year one "Just-as-good-as-lake-asphalt" follows another into oblivion.

Trinidad Liquid Asphalt

Bermudez Road Asphalt

Trinidad Lake Asphalt

Meanwhile the use of the lake asphalt steadily increases, and their position as the standard materials by which all others are judged is more firmly fixed (1) by the continued good service of natural asphalt roads and pavements, some of which, though 30 years old, are in service today; and (2) by the duplication of unfortunate experience with artificial or near-asphalts.

Engineers and officials with reputations to preserve, and taxpayers whose money is to be spent, may well consider also that even if there was any material for paving and road-building equalling the lake asphalts in stability, dependability and long life, **it would take 30 years to prove it.**

Before deciding any road or paving problem, advantage may profitably be taken of this Company's 30 years' experience, which is at the disposal of every-one interested in good roads and streets. Expert opinions, estimates, specifications and other information will be furnished upon application to

ROAD DEPARTMENT

The Barber Asphalt Paving Company

PHILADELPHIA, PENN.

The MUELLER Water Tapping Machine

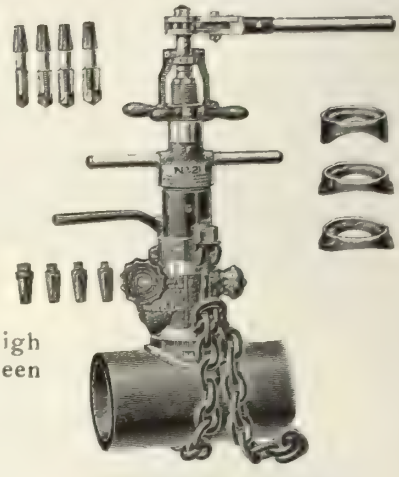
is the most mechanically perfect, most simply constructed, and gives the greatest number of years of perfect service of any tapping machine ever built.

For over 56 years this has been proved in the U.S., and as a result, over 90% of the tapping machines in the U.S. are **Mueller** machines; a great number of which have been in service for 25 to 30 years.

Mueller tapping machines are now made in Canada; and according to exactly the same high standard that **ALL Mueller** machines have been built.

Will you write us for description and prices? A post card will do.

"MADE IN CANADA"



MUELLER No. 2 Machine

H. MUELLER MFG. CO., LTD., SARNIA, ONTARIO

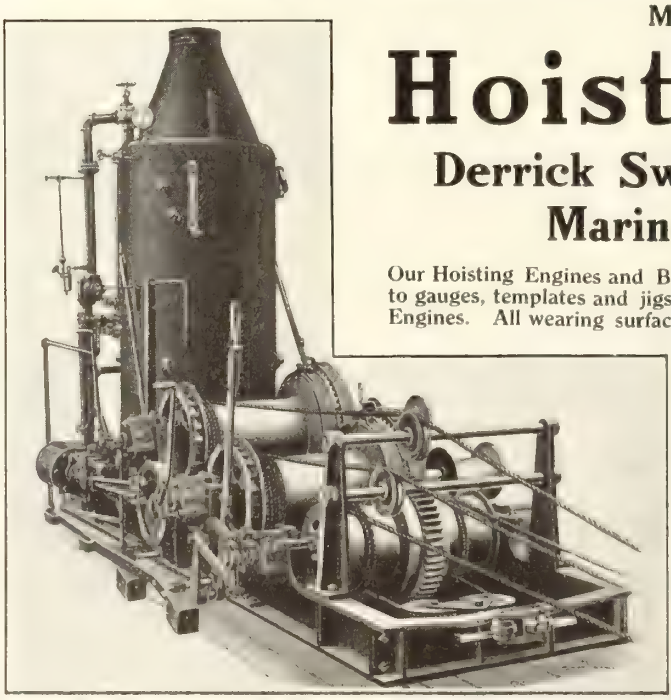
Decatur, Illinois **New York City** **Chicago** **San Francisco**

The Doty Marine Engine and Boiler Co. Limited

Manufacturers of SUPERIOR

Hoisting Engines

Derrick Swingers, Material Elevators, Marine Engines and Boilers



The above half tone illustrates our Standard double Drum double Cylinder Hoisting Engine with Derrick Swinger attached.

Our Hoisting Engines and Boilers are strictly up-to-date in both design and construction, built to gauges, templates and jigs, but we are rarely ever called upon to furnish repair parts for our Engines. All wearing surfaces are extra large and parts proportioned to withstand maximum stresses with an ample factor of safety. All iron castings are extra tough having a percentage of steel added in their make up. Our hoisting Engines are built for business and built to last.

Our boilers are built for service and have the regulation firehole, handholes, fusible plug and fittings required by the Provincial boiler building laws of Ontario, Saskatchewan, Alberta and B.C.

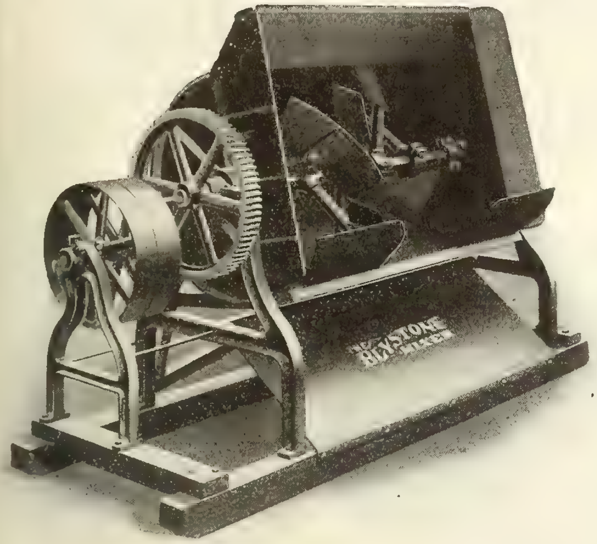
Our aim is to keep all standard sizes in stock at our Goderich Works, and if we cannot supply you from Stock, our facilities enable us to put through your order with least possible delay.

Write us for prices and deliveries

Doty Marine Engine and Boiler Co., Ltd.
Works: GODERICH, Ont.

Doty Engine Works Co. of Winnipeg Ltd.
Foot of Water Street, WINNIPEG, Man.

The Best Service at Lowest Cost



The Blystone Skid Mixer
The perfect design and construction of this mixer reduces the working cost to a minimum and effects the greatest ease in operation. All working parts are strongly made and will not get out of order.

Easy to work—Easy to Clean High efficiency—Low cost

SEND FOR PARTICULARS

The Blystone Machinery Company
61 Railroad St., CAMBRIDGE SPRINGS, Pa., U.S.A.
Full line of Blystone Mixers carried in stock by
The A. R. Williams Machinery Co., Limited, Toronto, Ont.
N. J. Dinnen & Co., Limited, Winnipeg, Man.
Gorman, Clancy & Grindley, Calgary, Alberta.
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"Metallic"

CORNICES

We can supply cornices promptly in a great variety of styles, suited to different styles of buildings. We are well equipped to turn out special cornice of the simplest or most elaborate design.

Our long experience in planning and constructing sheet metal building materials enables us to be of valuable service to you in planning cornices that will harmonize most properly with your building plans. Write for full particulars and catalog Z.

THE METALLIC ROOFING CO.
OF CANADA LIMITED,
TORONTO AND WINNIPEG

Contractors' Acetylene Flare Lights

Made in Two Sizes

SIZE NO 1—

8,000 Candle Power, operates 12 Hours on 18 lbs. Carbide.

Price F.O.B. Ottawa $95.00.

SIZE NO. 2—

1,000 Candle Power, operates 12 Hours on 8 lbs. Carbide.

Price F.O.B. Ottawa $65.00.

Manufactured by

International Marine Signal Co. Limited
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Used Machinery and Contractors Plant

FOR SALE

40—4 Yard Dump Cars 36" Gauge (at a Bargain)
1—70 Ton Vulcan Steam Shovel
1—5 Ton Tandem Roller
1—Gasoline Tractor 12 Ton Capacity
1—9x16, 39 Gauge Porter Locomotive, 12 tons
1—Ledgerwood Cableway, 1450 Feet
1—40 foot Steam Yacht
1—No. 5 Champion Stone Crusher
1—10 Ton Stiff Leg Derrick
1—7x12 Marsh & Henthorn Hoist D. D. and Swinger.
1—35 H.P. Locomotive Type Boiler
1—30 H.P. Locomotive Type Boiler
1—1/2 Yard Smith Concrete Mixer
1—12x16 Waterous Stationary Engine
1—7x12 Beatty Hoist D. D. and Swinger.

The above machines are but slightly used and are in good working order.

Fleming Machinery Company
340 Sparks Street, Ottawa, Can.

"Superior Graphite Paint"

For the Protection of Steel

Is used so largely because it has behind it a successful reputation of 25 years. Its use insures either exposed or enclosed surfaces, against rust.

Leading ENGINEERS and ARCHITECTS specify "Superior Graphite Paint" for all metal work because for similar work it has shown ACTUAL PROVEN MERIT.

Write for new booklet on PROTECTING STEEL STRUCTURES, and for full information to

Dominion Paint Works, Limited

Montreal Walkerville, Ont. Winnipeg
Toronto Made in U.S.A. by Detroit Graphite Co., Detroit, Mich. Vancouver

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Carbonizing Coating Paint

The most durable and least expensive Paint made for preserving Iron or Steel in Bridges, Buildings, Structural Shapes, Gas Plants, etc.

Galvanum Paint

The only Paint that will adhere for years to Galvanized Iron roofing, siding, cornices, etc.

Concrewaltum Paint

The only Paint that will beautify and make walls, ceilings, tile, concrete, brick and stone walls moist-proof and sanitary. Produced with strong luster finish or semiluster, or flat finish. Can be frequently washed without injury.

Manufactured in the United States and England by

The Goheen Manufacturing Co.

CANTON, OHIO., U.S.A., and Dock House, Billiter St., LONDON, E.C., ENG.

For sale by SANDERSON PEARCY & CO., LIMITED, Toronto, Ontario, Canada

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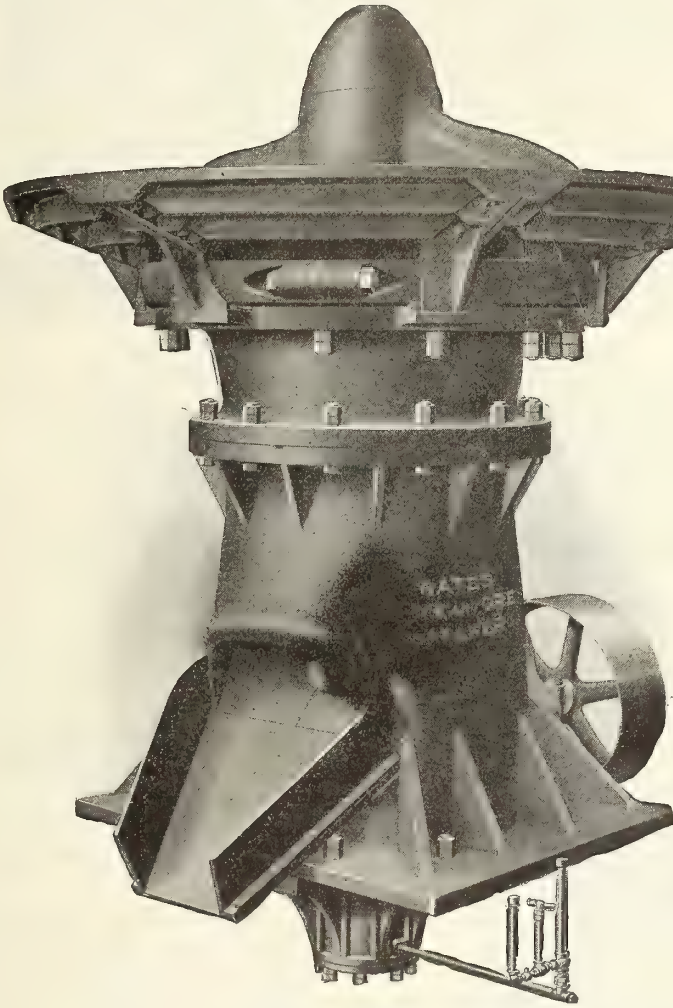
ROCK CRUSHING PLANTS

DESIGNED AND BUILT



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Bulletin 1415 "D" Breakers
" 1425 Screens

Bulletin 1435 Elevators
" 1448 "K" Breakers

Bulletin 1411 Modern Rock Crushing Plants

CANADIAN ALLIS-CHALMERS

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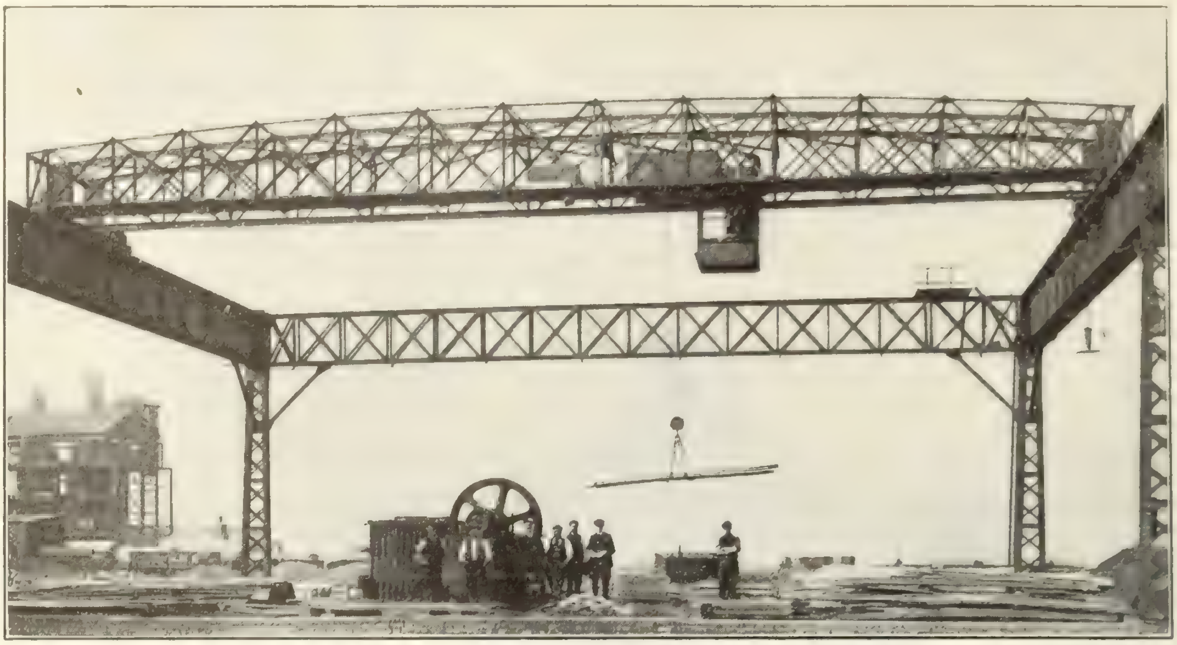

Yard Crane at Steel Mill of Sir Alfred Hickman, Limited, Bilston, Staffordshire

Royce
Electrical
Cranes
Capstans
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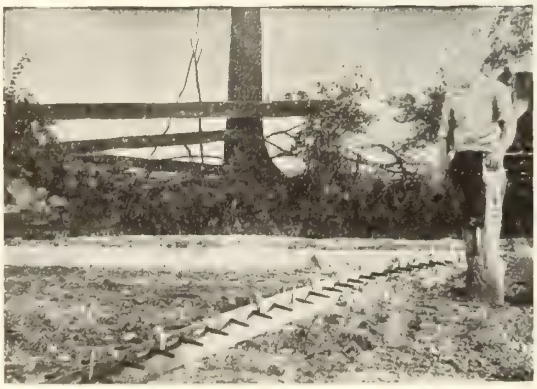
Include Royce Crane Type Motors, Controllers, Over Hoisting Safeguard.

YOUR ENQUIRIES ARE SOLICITED FOR

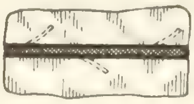
CRANES TELFERS CAPSTANS WINCHES

ROYCE, LTD., Trafford Park, Manchester, England



Send for This Book on Concrete Pavements

Our booklet on concrete pavements illustrates and describes pavements in many different cities, giving cost data and describing in detail the methods used. Complete specifications for the ideal concrete pavements are included as well as instructions for installing Baker plates. This booklet is sent without charge to responsible engineers contractors and highway officials.



Longitudinal Section Showing Joint.

Cross-Section of Pavement Showing Expansion Joint.

Baker Armor Plates

Protect Your Concrete Pavement at its Weakest Point—the Expansion Joint

Wayne County's 70 Miles of Concrete Roads Prove that the Baker Plate Has Solved the Expansion Joint Problem.

"The only surface repair required on our concrete roads has been on the roads first constructed, where the joints were not protected with the 'armor' plates."

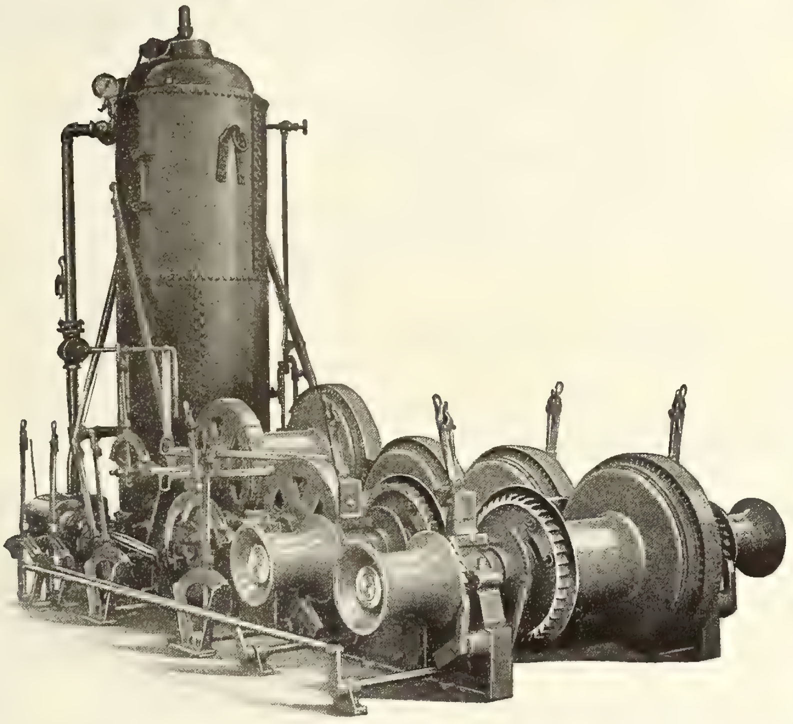
Extract from Sixth Annual Report of the Board of Country Road Commissioners, of Wayne County, Mich., Sept. 30th, 1912.

Our new system of installing Baker Armor Plates is simplicity itself, and holds the joint to perfect line and grade.

We guarantee Baker Armor Plates to be perfectly crowned as specified, and entirely free from defects of manufacture.

R. D. BAKER CO., 73 Home Bank Bldg. DETROIT, - MICH.

"BEATTY" HOISTS



Special Bridge Erection Engine furnished the Canadian Bridge Company, the Hamilton Bridge Works Company and the Dominion Bridge Company.

The two rear drums have internal ratchets and pawls automatically holding the load in any position. The two front drums have standard ratchets and pawls, also four independent winch heads. Boiler is of extra height to propel car and furnish steam for air compressor.

Standard Sizes of Hoisting Engines shipped from stock.

Six sizes of Clamshells on hand.

Quick shipment of any type of Excavating or Material Handling equipment for use on land or water.

"Beatty Plant" on your work means continuous service and complete satisfaction.

Let us give you the benefit of our Fifty Years of Experience in Building Contractors Machinery.

Full information gladly sent you. Write now.

M. BEATTY & SONS, LIMITED

WELLAND, ONTARIO

H. E. Plant, 1790 St. James St., Montreal
Robt. Hamilton, Vancouver, B. C.

H. W. Petrie, Limited, Toronto.
E. Leonard & Sons, St. John, N. B.

E. Leonard & Sons, Calgary, Alta.
All carry our equipment in stock.

NATIONAL PIPE & FOUNDRY CO., LIMITED

WATER WORKS CONTRACTORS

MANUFACTURERS OF

WOODEN WATER PIPE

For water works systems, domestic water supply and hydraulic mining. Insulated wire conduits; steam pipe casings; acid-proof pipe for mines, tanneries and pulp mills. Sizes from 2 inches to 24 inches.

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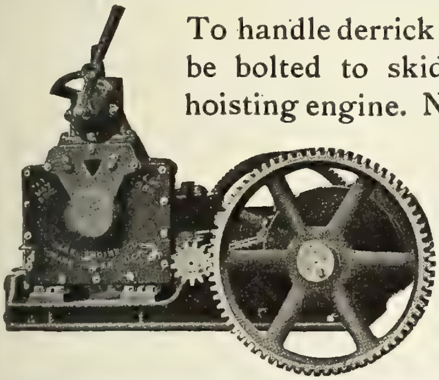

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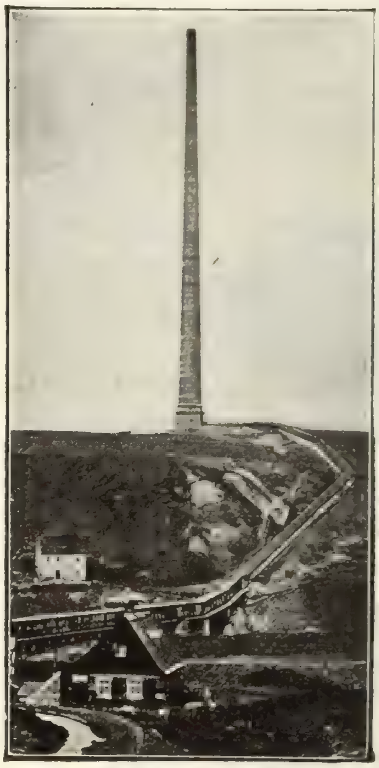

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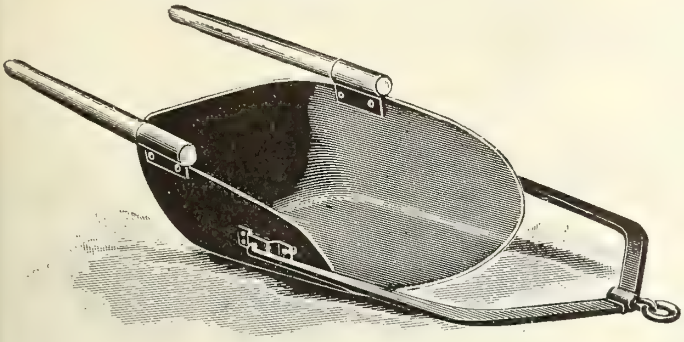

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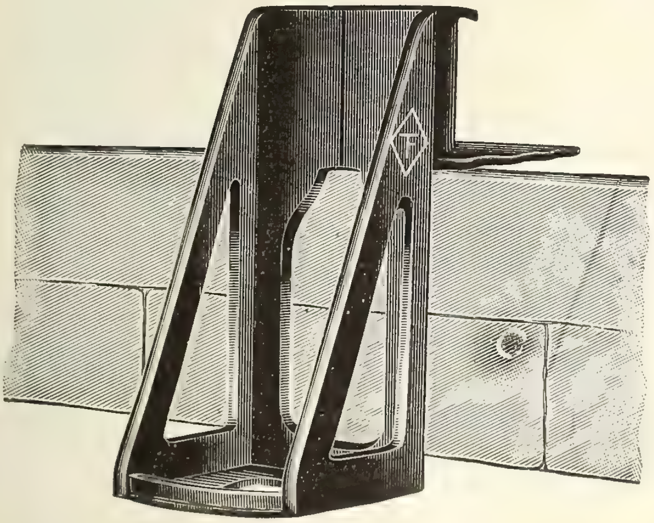

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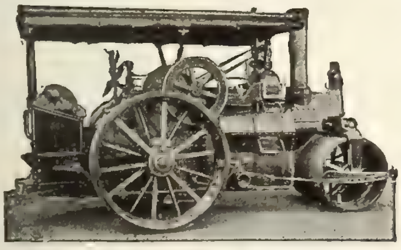

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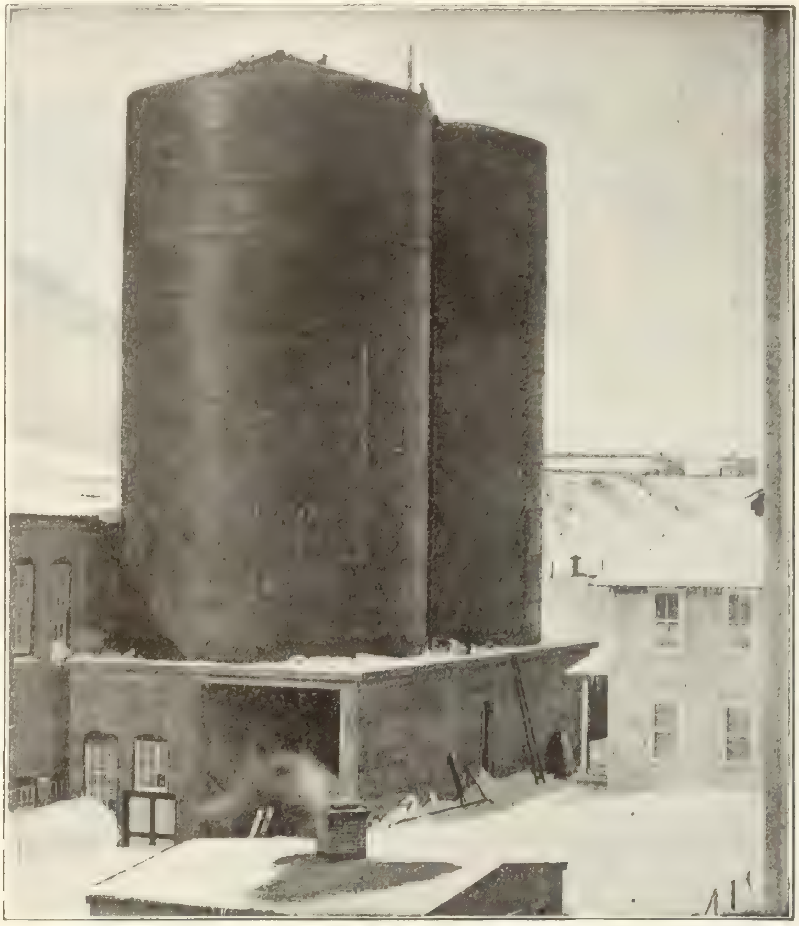

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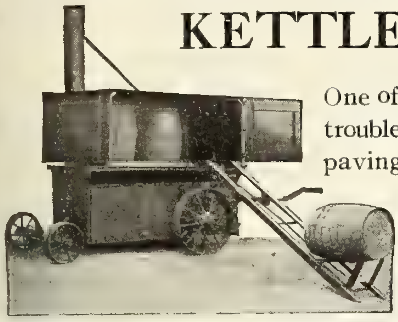

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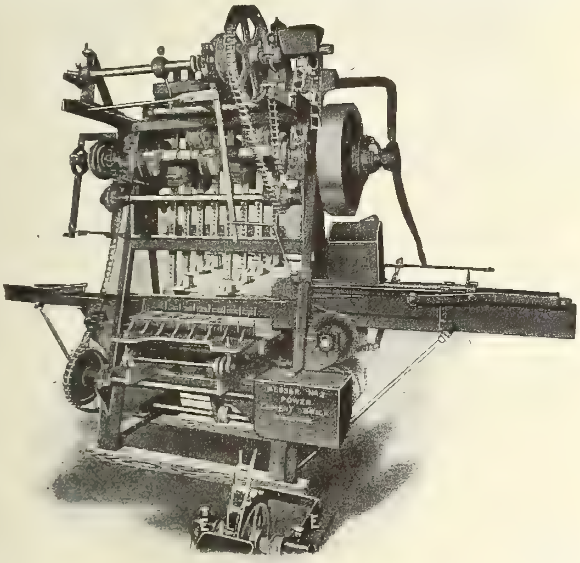

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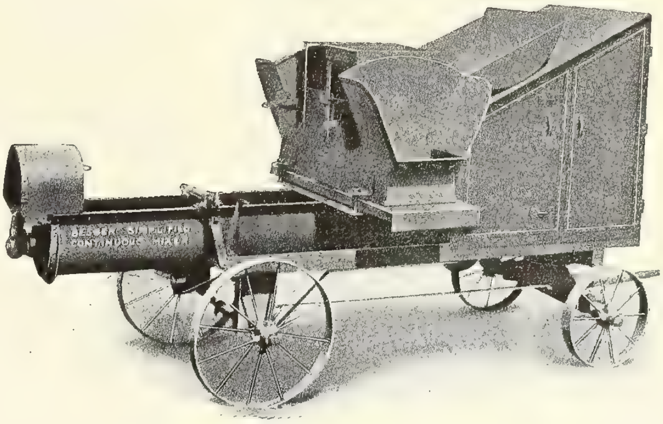

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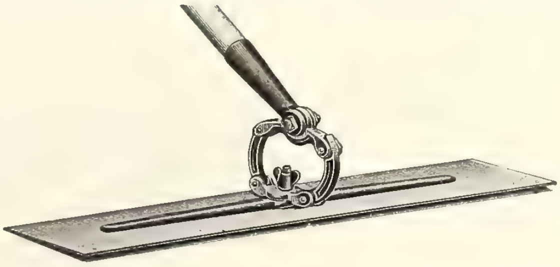

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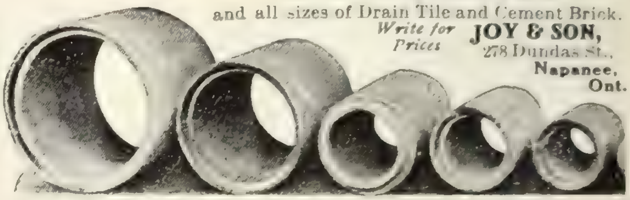

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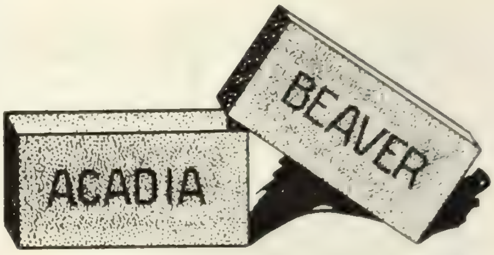

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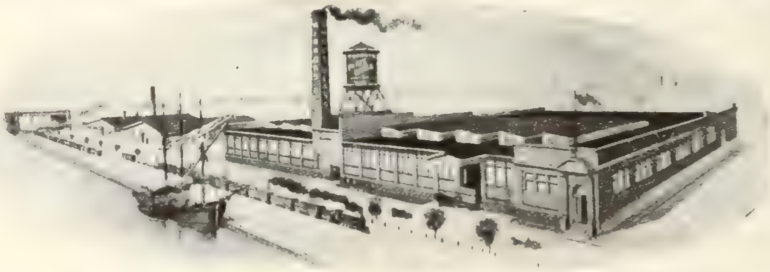

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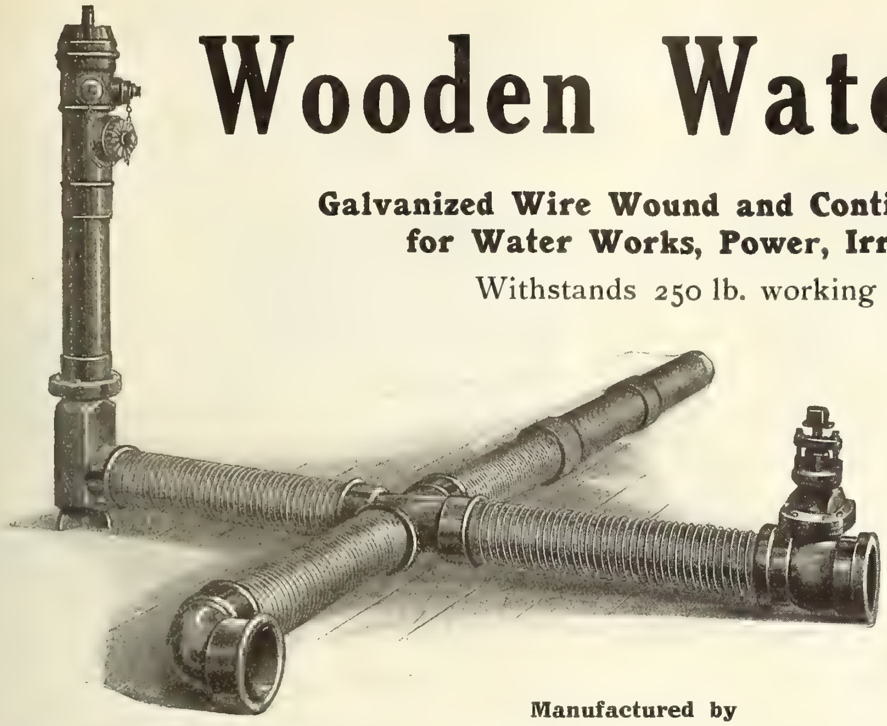

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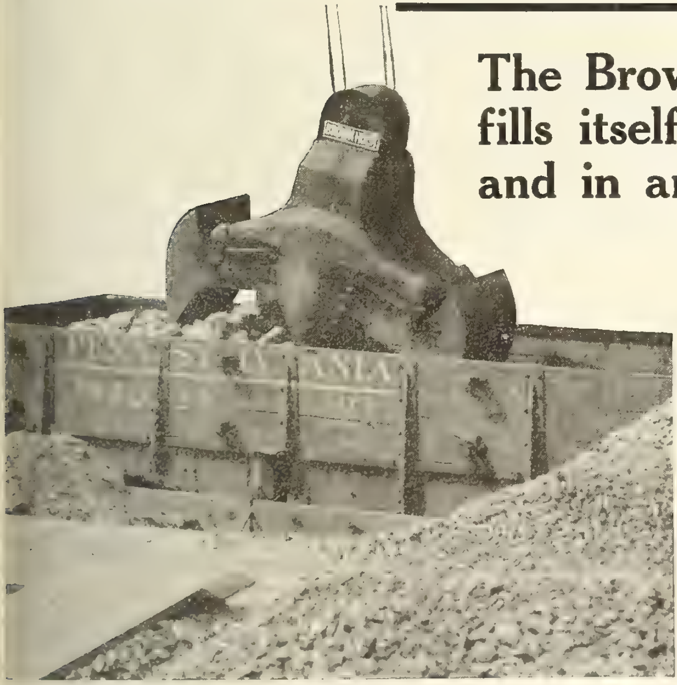

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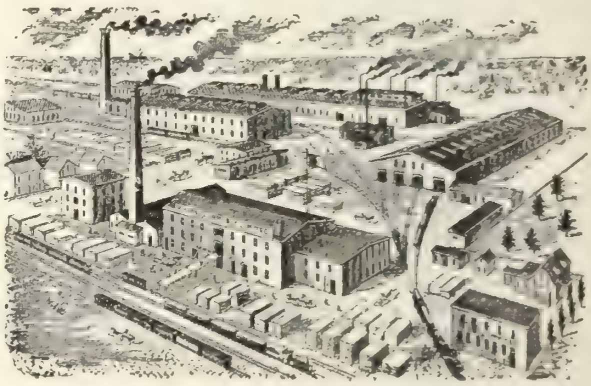

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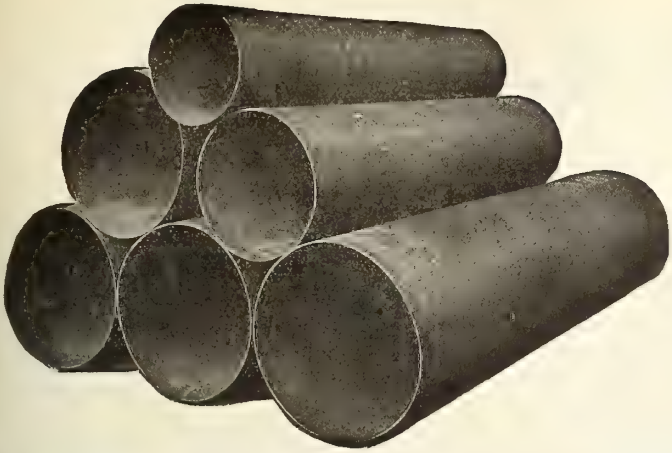

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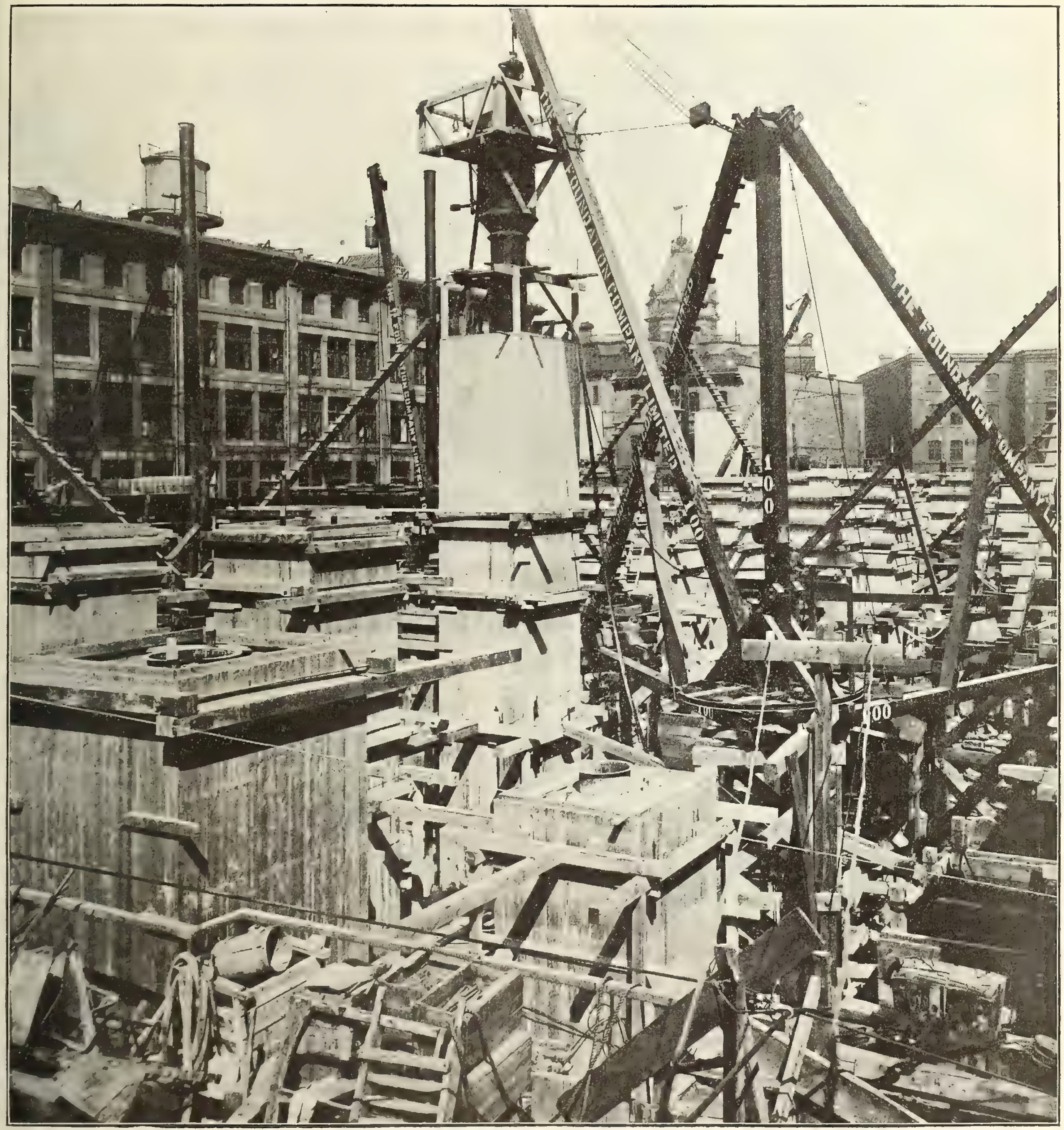

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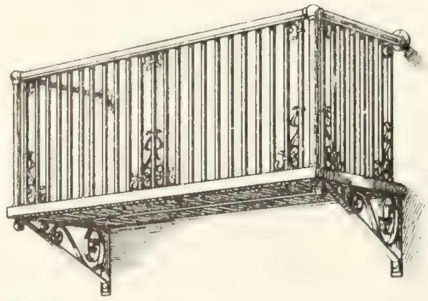

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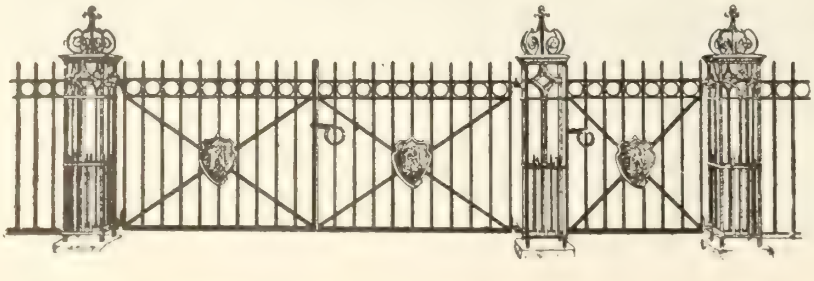

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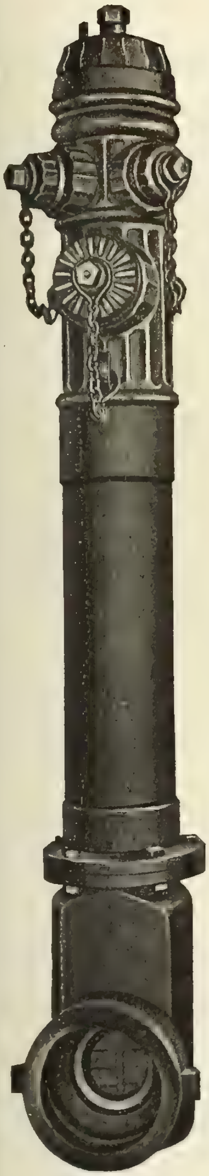

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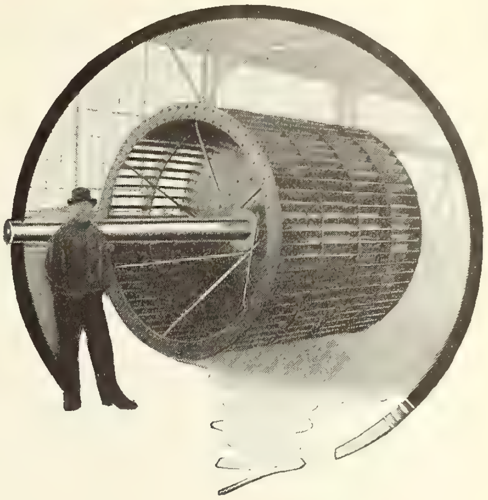

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Ventilating Fan

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Our Engineering Department will gladly co-operate with you in the selection of the proper equipment for YOUR needs.

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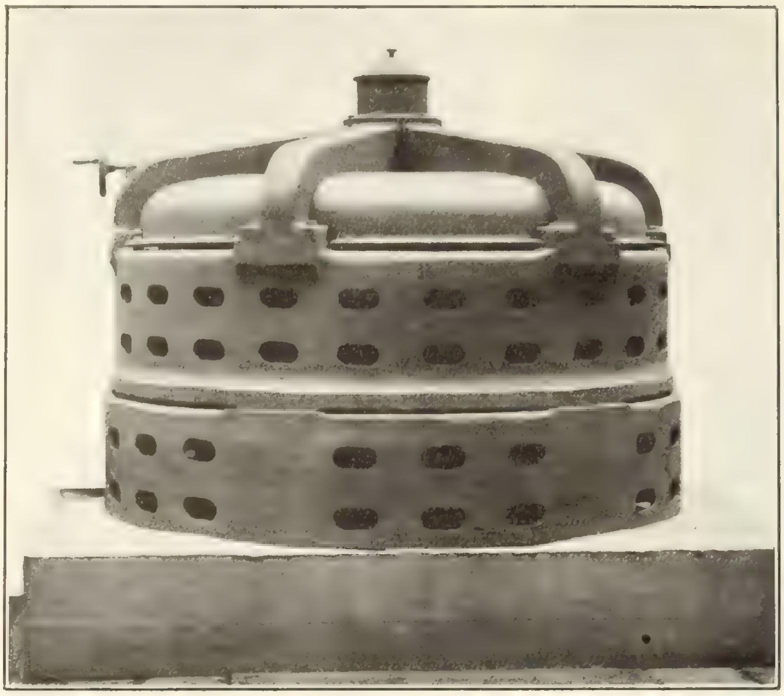

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Simple, Foolproof, High Efficiency
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This building is but one of the many large contracts executed by us.
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It also gives instructions for ordering and installing, etc. If you use cable terminals you should have this new bulletin.

Write our nearest office for Bulletin No. 700-1C.

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THE Underwood embodies in one machine all that can be expected in a typewriter. It is sold at the price which should be paid for a machine of its quality.

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All Canadian Cities

"Buffalo" Punches Shears and Drills

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Canadian Buffalo Forge Co.
MONTREAL Limited
St. John Winnipeg
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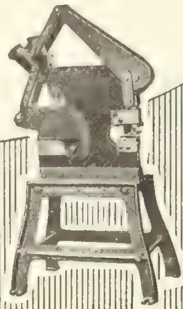

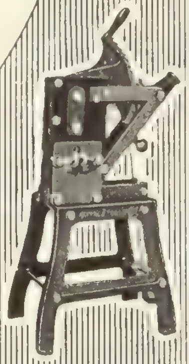

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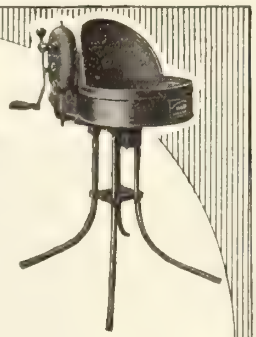
"Built to Last"



is the slogan of our **1912 Rivet Forge.** The repair cost by this design is guaranteed to be actually **cut in two,** compared with any other forge now in the market. A bridge company using a large number of forges writes us regarding it: "The operator claims it runs easier and heats more rivets in less time than any forg he has ever used." Let us send you one on free trial. Fifty other styles, for light and heavy work.

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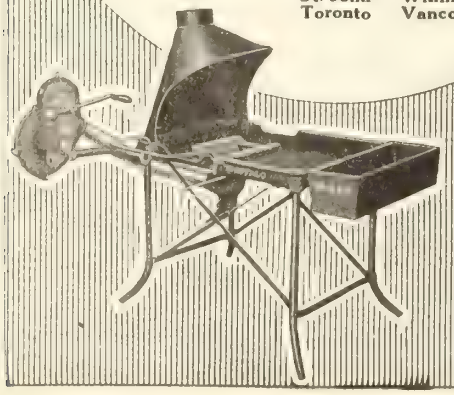

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For Water-proofing Concrete.

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For Surface Hardening Concrete Floors.

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13 Questions For the Contractor To Answer

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If as a contractor you are not using motor trucks, ask yourself the following questions and answer them honestly:—

1. How many horses have you?
2. How much money have you invested?
3. How much does it cost per day to operate your teams?
    - (a) Including interest on total investment for horses, trucks, harness and other equipment?
    - (b) Stable charges?
    - (c) Drivers, etc.?
4. What is the life of a horse?
5. Do you figure depreciation on this basis?
6. How many cubic yards or tons can you haul per day?
7. Are you willing to be convinced that motor trucks can do this amount of work at a lower cost?
8. Can you improve your loading and unloading facilities to reduce time lost in this way?
9. What is your average length of haul?
10. How many trips can you make with horse trucks?
11. Do you know that a single automobile truck is doing the work of four horse teams in your business?
12. Is there any reason why the automobile truck cannot do as much for you?
13. Isn't it worth your while to investigate this situation?

Ask us about the "MACK"

The Canadian Fairbanks-Morse Co., Limited

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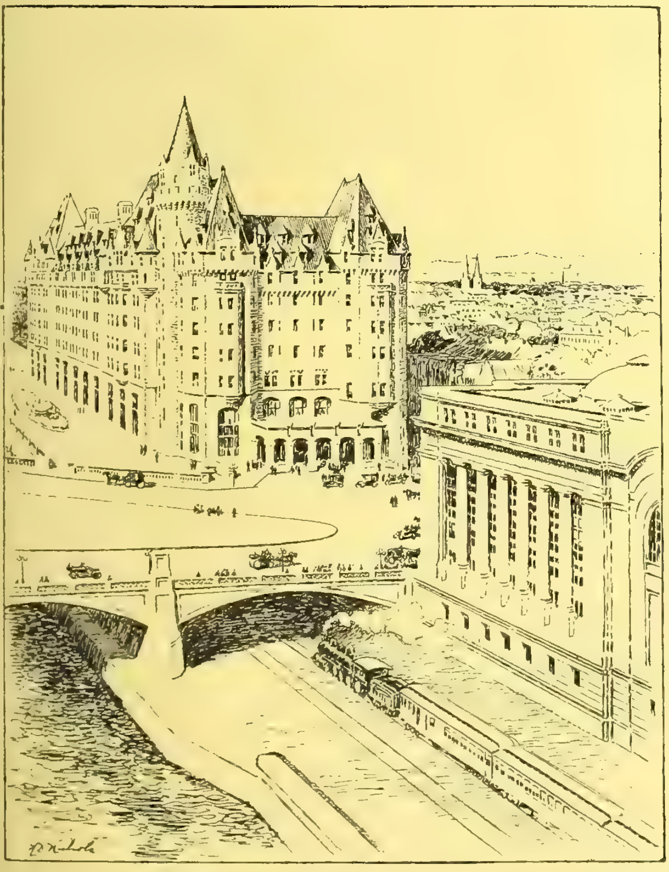
8



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These buildings were wired throughout with "Adanac" Rubber Insulated Wire.

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Every Builder and Contractor should have.

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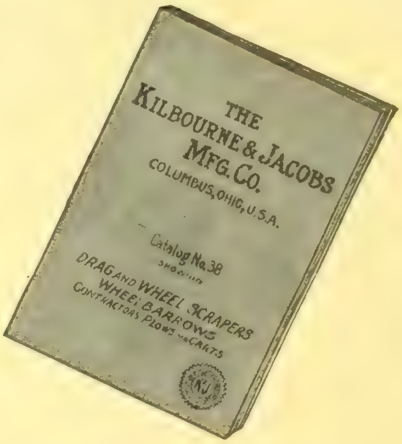

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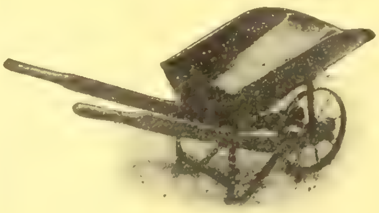
This New No. 38 Kilbourne & Jacobs' Catalogue illustrates and describes fully every style of barrow, wheel or drag scraper and plows. You may require equipment of this description—perhaps not at the moment but later on. This book will surely be of assistance to you as you can select the proper style of barrow, etc., for your requirements. Let us send you a copy—free for the asking.

"Kilbourne & Jacobs" Wheel Barrows



All styles in
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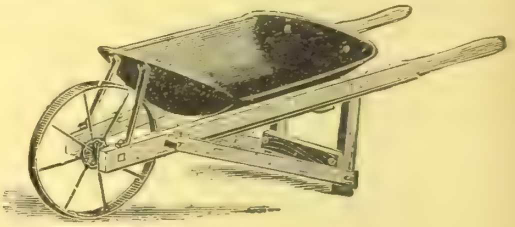
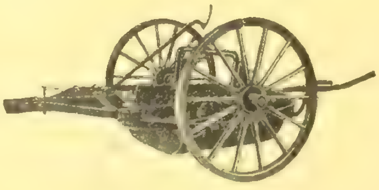


Wheel and Drag Scrapers



F. H. Hopkins & Co.

MONTREAL

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Vol. 27 Toronto, August 27, 1913 No. 35

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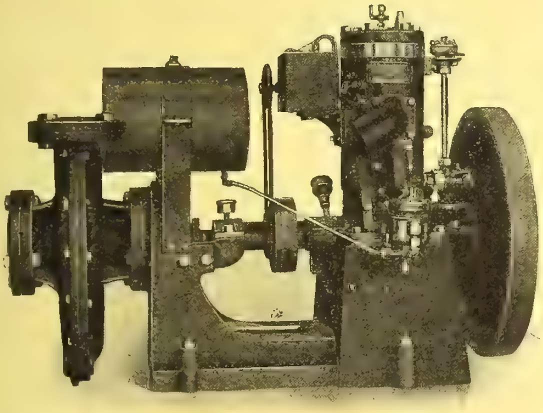
We manufacture all kinds of Steam and Power Pumps for all kinds of services, using only the best material and workmanship.



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Made in all Kinds of Glass on Short Notice

Large Bent Plate Glass for Shop Fronts a Specialty

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OF BELLISS MAKE
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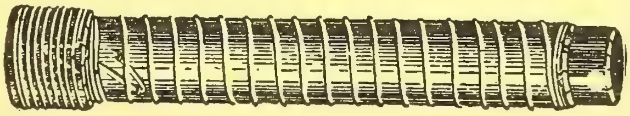
Laurie & Lamb
Board of Trade Building, MONTREAL



Continuous and Machine Banded Wood Stave

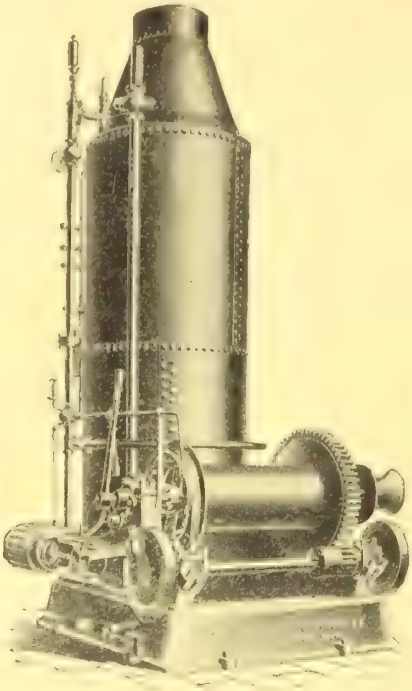
WATER PIPE

RESERVOIR TANKS

for city and town Water Systems, Fire Protection, Power Plants, Hydraulic Mining, Irrigation, etc. One-half the cost of Iron Pipe—and better.

Pacific Coast Pipe Co., Limited
P. O. Box 563 Vancouver, B. C.
Office and Factory, Granville St., near High Bridge
WRITE FOR CATALOGUE
Full Particulars and Estimates Furnished

Alphabetical Index of Advertisers, Page 16 Classified Directory to Advertisements, Page 6



Hoisting Engines

¶ To the Contractor who wants a good reliable and efficient hoisting engine,—one that will always be right on the job—we suggest an inquiry into our wide range of this type of machine.

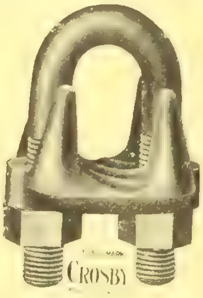
Any one of our offices will help you find the engine best suited to your needs.

The JENCKES MACHINE COMPANY, Limited

General Offices: SHERBROOKE, QUE.

WORKS: SHERBROOKE, QUE. ST. CATHARINES, ONT.

Sales Offices: Sherbrooke, St. Catharines, Nelson, B.C., Vancouver, Montreal, Cobalt, S. Porcupine



IF YOU ARE A CONTRACTOR

Using Wire Rope

YOU NEED THE

GENUINE "CROSBY" SLIP IT HOLDS

Drop forged steel—Galvanized, cannot break, slip nor rust. Has nine times the strength of cast clips.

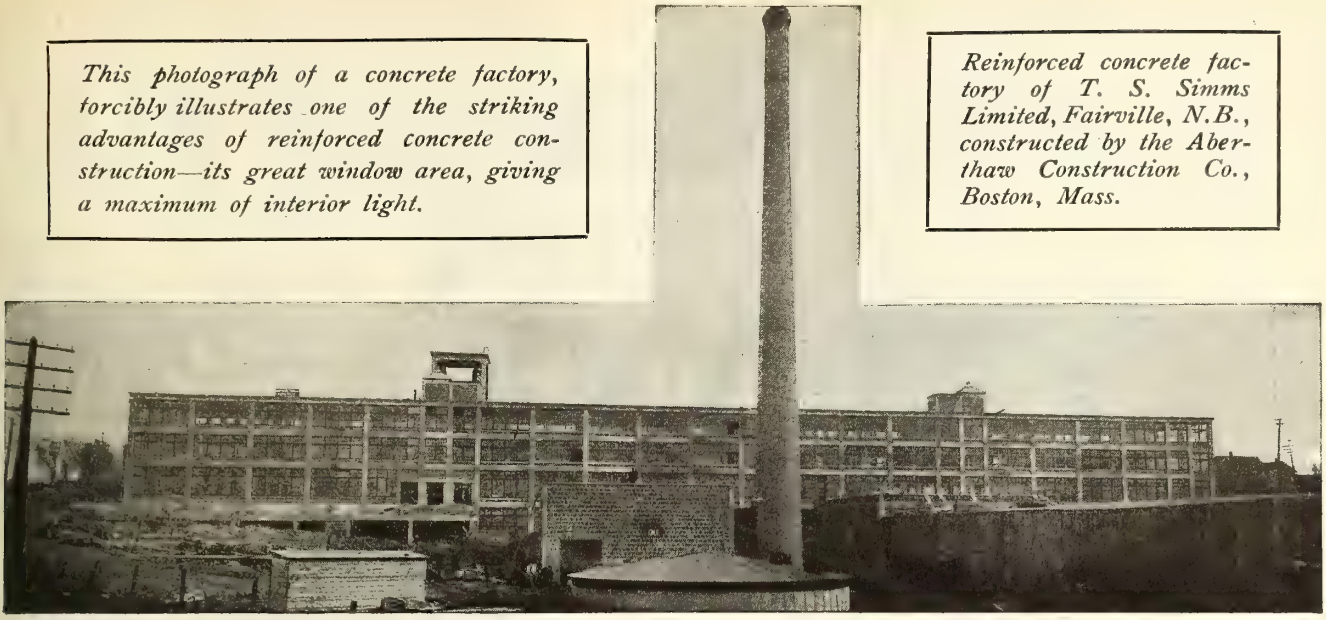
Made By

American Hoist & Derrick Co.

St. Paul, Minn.

SOLD BY

Dominion Wire Rope Co , Limited.—Montreal, Can.
General Supply Co. of Canada, Ltd., Montreal, Ottawa, Toronto, Canada.
Stuart Machinery Co.—Winnipeg, Man.
Vancouver Machinery Depot, Ltd.—Vancouver, B. C.
Gorman, Clancey & Grindley—Edmonton and Calgary Alta., and Nelson, B. C.



This photograph of a concrete factory, forcibly illustrates one of the striking advantages of reinforced concrete construction—its great window area, giving a maximum of interior light.

Reinforced concrete factory of T. S. Simms Limited, Fairville, N.B., constructed by the Aberthaw Construction Co., Boston, Mass.

Concrete Factories are Most Efficient

The efficiency of a machine is the ratio of the amount of work a machine does to the amount of work required to operate it. The output is equal to the input minus the work lost or wasted. The less wasted the greater the efficiency.

In the same way the efficiency of a factory may be defined as the ratio of output to input. Output financially, is increased by reducing unnecessary expenses.

Concrete Stops Wastes

Concrete buildings are proof against fire, water and vermin. They give the maximum light and are sanitary. They resist vibration, and are permanent and durable.

Fire-proofness reduces insurance rates. Water or liquids used in certain processes will not leak through floors to destroy valuable goods below. Rats and other vermin find no place to live in a concrete building, thus eliminating losses from this cause. Maximum light and sanitary conditions increase efficiency of employees. Lack of vibration reduces wear and tear on machines. Permanency and durability reduce depreciation.

The way in which concrete stops these leaks is fully described in our handsomely illustrated 224 page book, "Factories and Warehouses of Concrete." It contains photographs and data of factories and warehouses for all classes of industries.

You can have a copy free if you will mention this advertisement.

Canada Cement Company

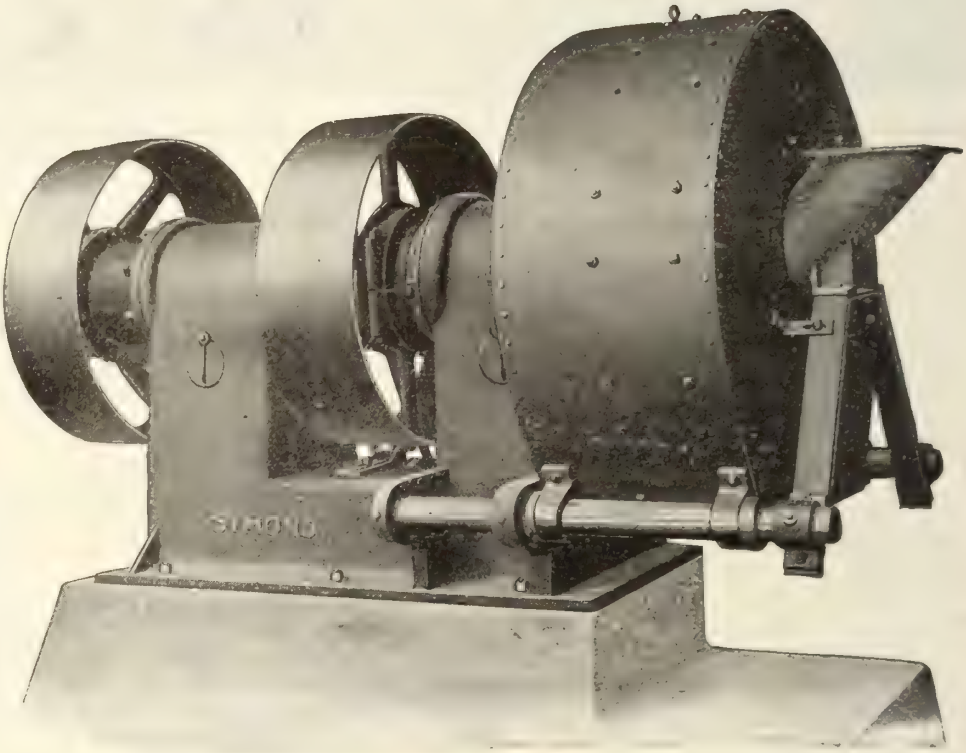
Limited

Montreal

IF YOU NEED CAPACITY

YOU NEED A

SYMONS DISC CRUSHER



The Greatest Recrusher on the market.

Will crush 40 Tons of Quarter Inch to 1000 Tons of Two and a Half Inch Stone per Ten Hour Day.

Catalogue No 46 Gives Full Information.

Montreal, 318 St. James St.
Toronto, 155 West Richmond St.
Cobalt, opp. Right of Way Mine.
Winnipeg, 259-261 Stanley St.

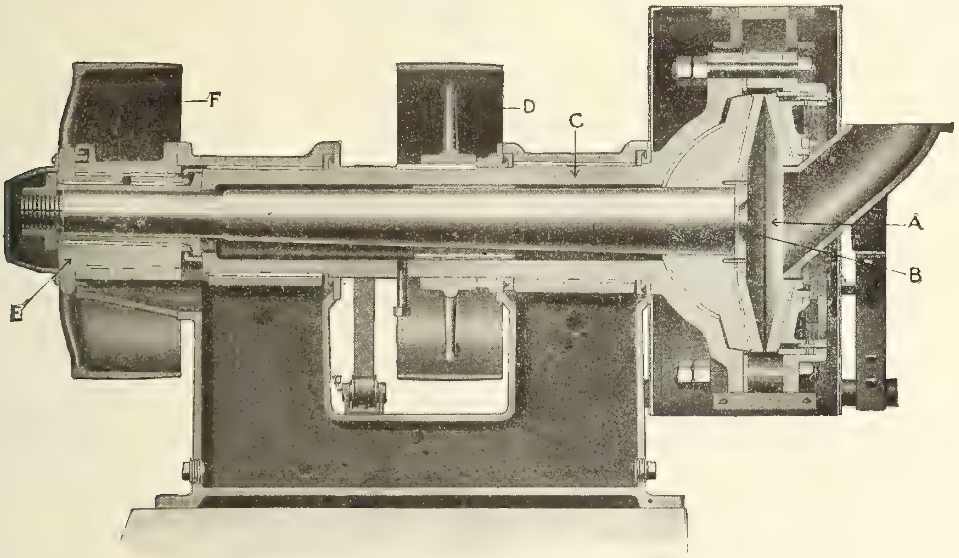
MUSSENS

SYMONS

Disc Crushers

Have a Crushing Principle Which Cannot be Duplicated in Any Other Machine.

The Symons is Completely Enclosed by Hinged Casings, Preventing the Escape of Dust.



Sectional View of Symons Disc Crusher

The Crushing Discs are Made of Manganese Steel, and Take Up their Own Wear, Wearing Smooth—Not in Grooves. Their Efficiency Is Not Impaired Until Completely Worn Through, Which Insures a Maximum Length of Service.

Made in Canada Under Our Own Supervision.

LIMITED

Calgary, 10th Ave. & 3rd St. E.
Vancouver, 365 Water Street
Quebec, 71 Maple Ave.
St. John, N.B., 57 Smythe St.
Halifax, 78 Granville St.

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Canadian Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd.

Architects
Weeks, Arthur L.

Architects' Instruments
Stanley Co., W. F.
W. & L. E. Gurley.

Architectural Iron Work
Canadian Allis-Chalmers, Limited.
Canada Wire & Iron Goods Co.
Dennis Wire & Iron Works.
Dom. Ornamental Iron Works.
Eberhard & Wood
McGregor & McIntyre
Meadows Co. Geo. B.
Steel & Radiation Ltd.

Architectural Metal Work
Feather & Roadhouse.
Ormsby Co., Limited, A. B.
Metal Shingle & Siding Co.
Metallic Roofing Co.

Architectural Terra Cotta
Black Building Supply Co., Ltd.
Don Valley Brick Works.
Gibbs & Canning.
Northwestern Terra-Cotta Co.
Toronto Plate Glass Imp't'g Co.

Asphalt
Asphalt & Supply Co.
Baker, John Jr.
Barber Asphalt Paving Co.
Canadian Mineral Rubber Co.

Belting
Can. Consolidated Rubber Co.
Goodyear Tire & Rubber Co.
Can. Fairbanks-Morse Co.
Dominion Belting Co.

Blowers
Canadian Buffalo Forge Co.
Can. Ingersoll-Rand Co., Ltd.
Canadian Sirocco Co.
Douglas Milligan Co.
Sheldons Limited
Sturtevant Co. of Can. Ltd., B. F

Boilers
Berg Machinery Mfg. Co.
Canadian Allis-Chalmers, Limited.
Boving Company of Canada.
Inglis Co., John.
Jenckes Machine Co.
Leonard & Sons, E.
Marsh & Henthorn.
McDougall Caledonian Iron Wks.
Mussens Limited.
Waterous Engine Works Co.

Boxes—Junction.
Standard Underground Cable Co.
of Canada Limited.

Brewers' Machinery
Linde British Refrigeration Co.

Brick
American Enamelled Brick Co.
Black Building Supply Co., Ltd.
Bradford Pressed Brick Co.
Douglas Milligan Co.
Don Valley Brick Works.
Hamilton Pressed Brick Works.
North-Western Terra Cotta Co.
Nova Scotia Clay Works.
Sydney Pressed Brick Co.

Brick Chimneys
Douglas Milligan Ltd.
Heinicke Co., H. R.

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Bechtels Limited
Berg Machinery Mfg. Co.
Sheldons Limited

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Canadian Allis-Chalmers, Limited.
Canadian Bridge Co.
Chicago Bridge & Iron Works.
Des Moines Bridge and Iron Co.
Dickson Bridge Works.
Dominion Bridge Co.
Hamilton Bridge Works Co.
Mackinnon-Holmes & Co.
McNeil & Co., W. P.
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Sarnia Bridge Co.
Scherzer Rolling Lift Bridge Co.
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Berg Machinery Mfg. Co.
Canadian Buffalo Forge Co.

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Browning Engineering Co.
Canadian Fairbanks-Morse Co.
Lecky & Collis.
Thew Shovel Company.

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Imperial Wire & Cable Co.
Standard Underground Cable Co.
of Canada, Limited.

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Britnell & Co.
Bremner, Alex.
Canada Cement Co.
McNally & Co., W.
Morrison & Co., T. A.
Ontario Lime Co., Ltd.
Rogers, Alfred Limited
Smyth & Ryan.

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Abram Cement Tool Co.
Wettlaufer Bros.

Coal Chutes
Galt Stove & Furnace Co.

Coal Handling Apparatus
American Hoist & Derrick Co.
Browning Engineering Co.
Brown Hoisting Machinery Co.

Combination Woodworkers
Hutchinson, M.

Concrete Mixers and Appliance ..
Blystone Machinery Co.
Canadian Allis-Chalmers, Limited.
Canadian Concrete Appliance Co.
Hopkins & Co., F. H.
Lecky & Collis.
London Concrete Machinery Co.
Mussens Limited.
Waterloo Cement Machinery Co.
Wettlaufer Bros.
Woodstock Wind-Motor Co.

Concrete Tampers
Canadian Warren Axe Co.

Conduits
Can. H. W. Johns-Manville Co.
Conduits Co., Limited.

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Eastern Pipe Construction Co.
Foundation Co.
Reggin & Spence.

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Beatty & Sons, M.
Browning Engineering Co.
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Canadian Concrete Appliance Co.
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Doty Marine Engine & Boiler Co.
Dore & Fils.
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Hopkins & Co., F. H.
International Marine Signal Co.
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Mussens Limited.
Royce Limited.
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Stinson-Reeb Builders' Supply Co
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Wettlaufer Bros.

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Weller Mfg. Company.

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Can. Ingersoll-Rand Co., Ltd.

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Linde British Refrigeration Co.

Corrugated Iron
Can. H. W. Johns-Manville Co.
Metallic Roofing Co.
Ormsby, A. B., Limited.

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Browning Engineering Co.
Brown Hoisting Machinery Co.
International Marine Signal Co.
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Cabot, Inc., Samuel.

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Smyth & Ryan.

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Jenckes Machine Co.
Lecky & Collis
London Concrete Machinery Co.
Mussens Limited.
Wettlaufer Bros.

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Hepburn, John T.

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Beatty & Sons, M.
Browning Engineering Co.

Drills
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Canadian Allis-Chalmers, Limited.
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Canadian Ingersoll-Rand Co.
Lecky & Collis.
Star Expansion Bolt Co.

Drill Steel Sharpeners
Canadian Ingersoll-Rand Co.

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Bechtels Limited.
Schell Foundry & Machine Co.
Western Wheeled Scraper Co.

Electric Air Rock Drills
Canadian Ingersoll-Rand Co.

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Engineering Works of Canada.
Ferranti Electrical Co.

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Boving Company of Canada.
Canadian Buffalo Forge Co.
Inglis Co. John.
Jenckes Machine Co.
Laurie & Lamb.
Leonard & Sons, E.
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Mussens Limited.
Sturtevant Co. of Can. Ltd., B. F
Waterous Engine Works Co.
Wettlaufer Bros.

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Campbell, R.
Chipman & Power.
Farmer, John T.
Galt Engineering Co., John
Lea & Ferguson.
Mitchell, C. H.
Thorold Co., F. W.

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Star Expansion Bolt Co.

Expanded Metal
Mannesmann Tube Co.

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Canadian Mineral Rubber Co.

Filters
American Water Softener Co.

Fire Brick
Improved Equipment Co.
Ontario Lime Co., Ltd.
Smyth & Ryan.

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Fuse (Safety Blasting)
Lecky & Collis.

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Sheldons Limited.
Canadian Sirocco Co.

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Wettlaufer Bros.

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struction Company.

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Wettlaufer Bros.

Hydrants
Canada Iron Corporation.
Gartshore-Thomson Pipe Co.
Kerr Engine Co.

(Continued on page 12)

Bank of Ottawa, Broadview and Gerrard, Toronto.

Don Valley Clay Products are found in fine residences, handsome office buildings, imposing banks, stately public buildings and even the aristocratic little bungalow is often constructed of these excellent products.

Don Valley Bricks have the beauty of appearance that is so necessary a factor in present day construction.

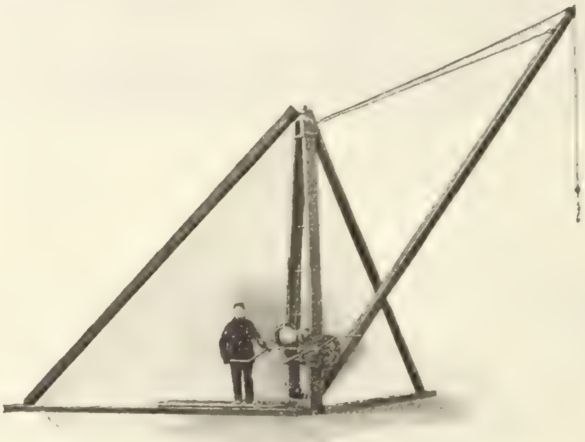
Specify "Don Valley Clay Products."

Don Valley Brick Works

Toronto, Ontario

Beath Scotch Derricks

Hand or Power



THE construction of Beath Scotch Derricks embodies several points of merit not found in other makes.

All stress parts are **steel** not cast iron. Bottom Pintle Bearing is of ball and socket type and works in a bath of oil, thus ensuring an easy movement at this joint.

Beath Derricks are provided with self-oiling bearings, ensuring easy operation and reducing wear to a minimum.

We also make Jinniwink Derricks, Stiff Leg Derricks, Guy Derricks, and Steel Derricks for heavy service. Hand or Power operated.

Send us your enquiries for Derricks

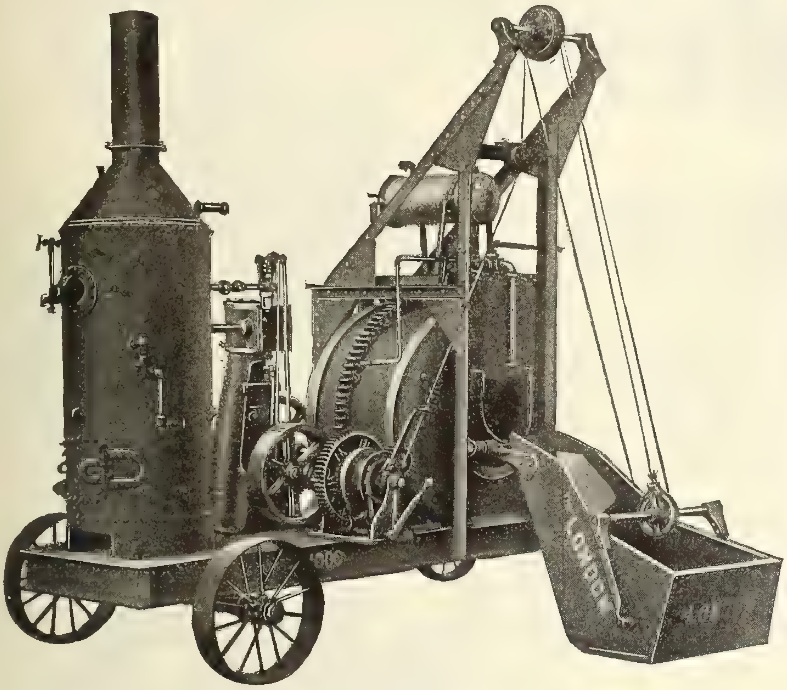
W. D. Beath & Son, Limited

ENGINEERS AND MANUFACTURERS

20-30 Cooper Ave., Toronto

The A. M. Ellicott Co., 301 St. James St., Montreal, Que., sole selling agents for Province of Que.

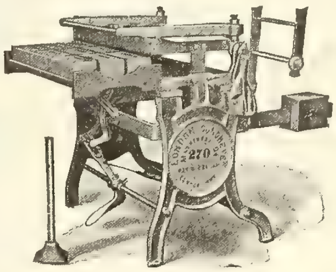
HAVE YOU SEEN OUR 180 PAGE CATALOGUE?



London Standard Drum Batch Mixer

Showing the largest line of Concrete Machinery ever crammed into a Catalogue.

All made in our own Factory and under a system producing an excellence of quality. Our large output right from Factory to the Contractor.



London Cement Brick Machine.

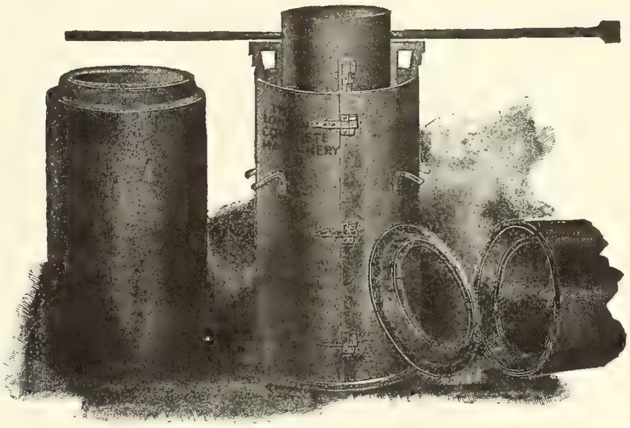
Even such remarkably low prices are preferable to exorbitant prices and small output.

Some people wonder how we can sell high grade machinery at such low prices. **It is quite simple. Our Enormous Sales and Small Profits are sufficient explanation.**

We manufacture over twenty different sizes and styles of **Concrete Mixers, Mortar Mixers, Concrete Block Machines, Cement Brick Machines, Cement Tile Machines, Tile Moulds, Rock Crushers, Screens and Elevators.**

London Cement Block Machine.

Gasoline Engines
Pumping Outfits
Steam and Gasoline Hoists
Material Elevators
Sidewalk Forms
Sidewalk Tile Machines
Concrete Carts
Wheel Barrows



London Sewer Pipe and Tile Moulds.

Sill, Step and Widow-Cap Moulds

A Complete Line of Cement Working Tools.

London Concrete Machinery Co., Limited

Head Office and Factory: Cabell St. and Kitchener Ave., London, Ont.

BRANCHES:

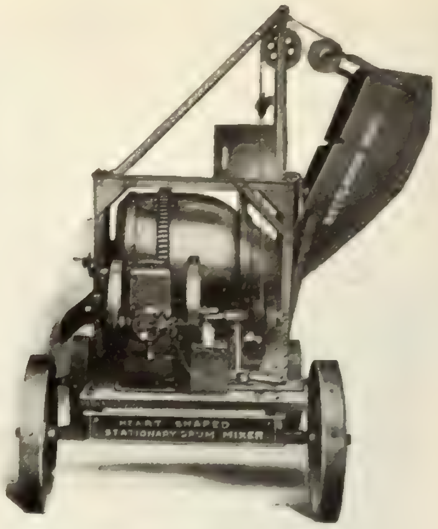
WINNIPEG (445 Main St.) W. H. Rosevear, Mgr. CALGARY (622 9th Ave. W.) P. D. McLaren, Mgr.
TORONTO (60 Richmond St. E.) F. D. Emsley, Mgr.

AGENCIES:

VANCOUVER, B. C. Equipment Co. MOOSE JAW, Sask. Bridge & Iron Co., Ltd. REGINA, H. A. Knight
FORT WILLIAM, Northern Eng. & Supply Co. MONTREAL, Foss & Hill Mach. Co. QUEBEC, A. D. Masson

We are the Largest Manufacturers of Concrete Machinery in Canada.

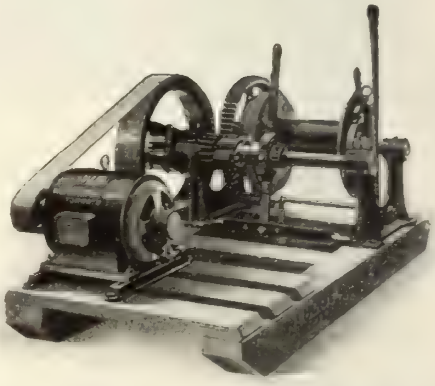
Wettlaufer
Hoists and Mixers



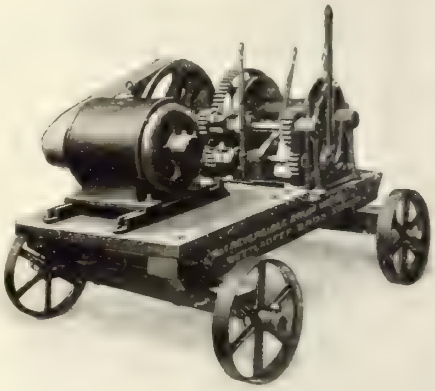
The house of Wettlaufer makes a mighty good hoist as well as the best mixer on the market. The hoists are simply, substantially constructed and are invaluable equipment to every contractor.

The new Wettlaufer Mixer illustrated is equipped with a stationary heart-shape drum.

The material empties from the hopper direct to the drum where that notable heart-shape idea turns the material in every way possible to produce perfectly mixed concrete.



Single Drum motor driven Wettlaufer Hoist.



Reversible Single Drum motor driven Wettlaufer Hoist on trucks.

Attend a daily demonstration at any of our branches and see for yourself what good mixers we make.

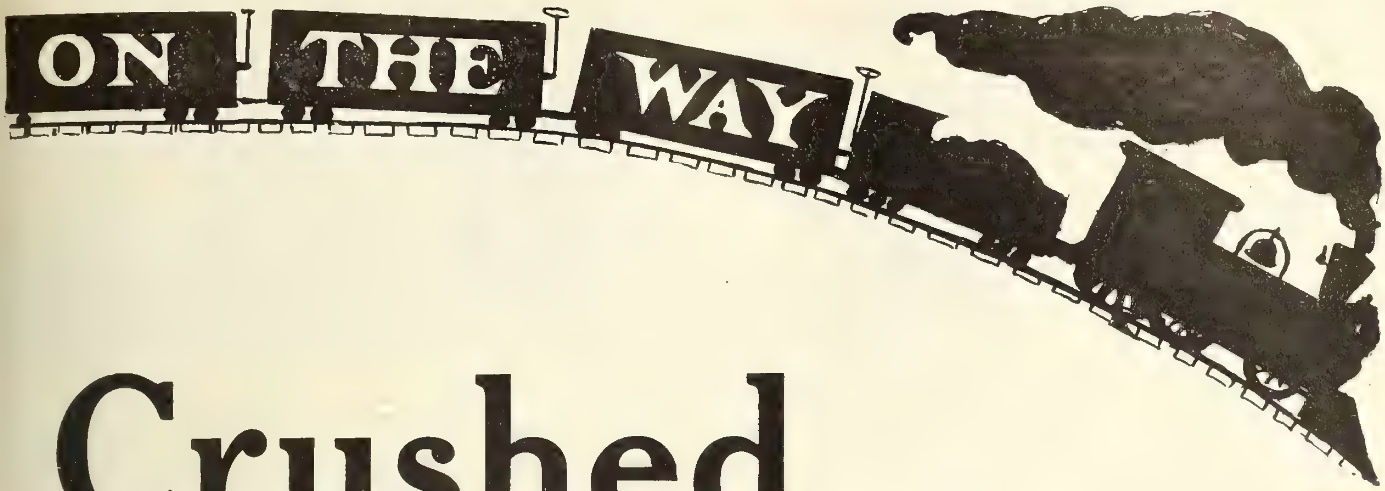
Wettlaufer Bros.

178 Spadina Ave., Toronto, Ont.

Factories: Mitchell, Ont., Buffalo, N. Y., Detroit, Mich.

AGENCIES:

A.E. Hodgert, Regina. Sask. Maysmith & Lowe, 1057 Mears St., Victoria, B.C. A.R. Williams Machinery Co., 15 Dock St., St. John, N.B. The Canadian British Engineering Co., Ltd., 324 Smith St., Winnipeg, Man. R.F. Mancill, 117 10 Ave. East, Calgary. The Hallman Machinery Co., 374 Alexander St., Vancouver, B.C. J. L. Lachance, Ltd., 363 St. Paul St., Quebec. Wettlaufer Bros. 316 Lagauchetiere St. W., Montreal



Crushed Stone

If you want crushed stone in a big hurry come to us and you will get it.

Our bins are always loaded to the top with stone of all grades and shipments can be made the day your order is received.

Quarries located at Dundas and Vinemount.

Portland Cement

Our several cement mills are located at various points that enable us to make prompt shipments with short hauls.

Send us your next order.

Alfred Rogers
Limited
28 King St. West, Toronto

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Batts Limited
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Lime Kilns
Improved Equipment Co.

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Boving Company of Canada.
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Montreal Locomotive Works
F. H. Hopkins Co.
Mussens Limited.

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Missisquoi-Lautz Corporation

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Metallic Roofing Co.
Noble, C. W.
Steel & Radiation Ltd.

Meters, Electrical
Ferranti Electrical Mfg. Co.
Canadian Allis-Chalmers.

Meters, Water
Hopkins & Co., F. H.
McDougal Caledonian Iron Wks
Neptune Meter Co.

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Hotchkiss Lock Metal Form Co

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Dominion Paint Works.
Goheen Mfg. Co.
Ottawa Paint Co.

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Dominion Paint Works.
Goheen Mfg. Co.
Pinchin, Johnson & Co.

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Asphalt & Supply Co.
Barber Asphalt Paving Co.
Dominion Creosoting Company.
Ontario Asphalt Block Co.
Paterson Mfg. Co., B.

Perforated Metals
Canada Wire & Iron Goods Co.
Greening Wire Co., B.

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American Spiral Pipe Works.
Canadian Allis-Chalmers, Limited.
Canadian Pipe Co.
Dominion Concrete Co.
Dominion Wood Pipe Co.
Gartshore-Thomson Pipe Co.
Munderloh & Co.
National Iron Works.
National Pipe & Foundry Co.
Pacific Coast Pipe Co.
Piggott & Co., Thos.
United States Cast Iron Pipe & Foundry Company.
Walsh Plate & Structural Works

Pile Driving Machinery
American Hoist & Derrick Co.
Browning Engineering Co.
Canadian Ingersoll-Rand Co.
Lecky & Collis.

Pipe Fittings and Flanges
Pittsburgh Valve, Foundry & Construction Company.

Planing Mill Exhausters
Canadian Buffalo Forge Co.
Sheldons Limited.
Canadian Sirocco Co.

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Canadian Ingersoll-Rand Co.

Plaster
Albert Mfg. Company.
Britnell & Company.
Crown Gypsum Company.
Ontario Lime Co., Ltd.

Plumbing
Dietrich Limited.

Pneumatic Machinery
Canadian Ingersoll-Rand Co.

Portable Saws
C. H. & E. Mfg. Co.
Canadian Fairbanks-Morse Co.

Portable Track
Bechtels Limited

Power Engines
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Jenckes Machine Company.
Canadian Allis-Chalmers, Limited.
Waterous Engine Works.

Pumps and Pumping Machinery
Beatty & Sons, M.
Boving Company of Canada.
Canadian Allis-Chalmers, Limited.
Canadian Buffalo Forge Co.
Canadian Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co.
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Inglis & Co., John.
McDougall Caledonian Iron Wks.
Smart-Turner Machine Co.
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Mussens Limited.
Ontario Wind Eng. & Pump Co.
Wettlaufer Bros.

Quarry Machinery
Canadian Allis-Chalmers Limited
Canadian Ingersoll-Rand Co.
Improved Equipment Co.
Lecky & Collis.
George Anderson & Co.

Railway Supplies
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Hopkins & Co., F. H.
Lecky & Collis.
Mussens Limited.

Refrigeration Machinery
Linde British Refrigeration Co

Reinforcements, Concrete & Steel
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Canada Wire & Iron Goods Co
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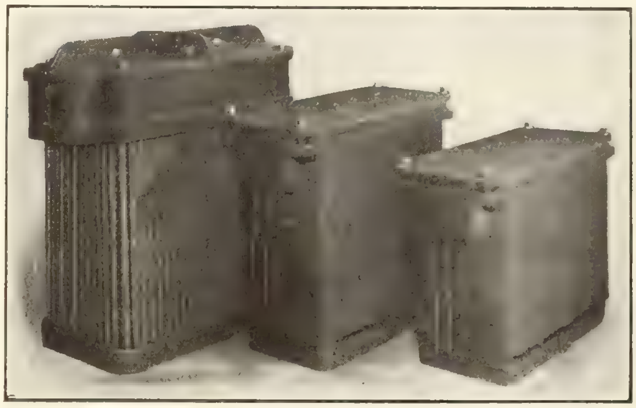
Power Logic

Reduced Loss
Increased Profit

Ferranti
Transformers



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All coils are wound with copper of ample sectional area, thereby reducing copper losses to a minimum.

Three phase transformers are the most economical type to operate and will effect a considerable saving in construction cost.

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IN this product you get a brick of such superior quality that a saving of one dollar a thousand can be effected in the laying of the bricks as compared with ordinary irregular brick.

The mortar adheres with great strength to "Sydney" pressed brick and they harden with age.

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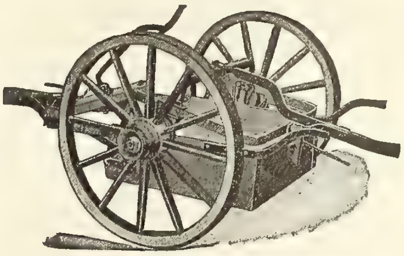

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None others are built as strong will give the same satisfactory service or contain the latest improvements.

The Westerns are noted for their capacity, light draft, simplicity and durability. They will shortly pay for themselves, and be paying you a handsome dividend on your investment.

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The Toughest Stone for Macadam in Ontario

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Total $376.17 or 5⅔c. per sq. yd. for repairs for nine years, a little over 6-10 of 1c. per sq. yd. per year.

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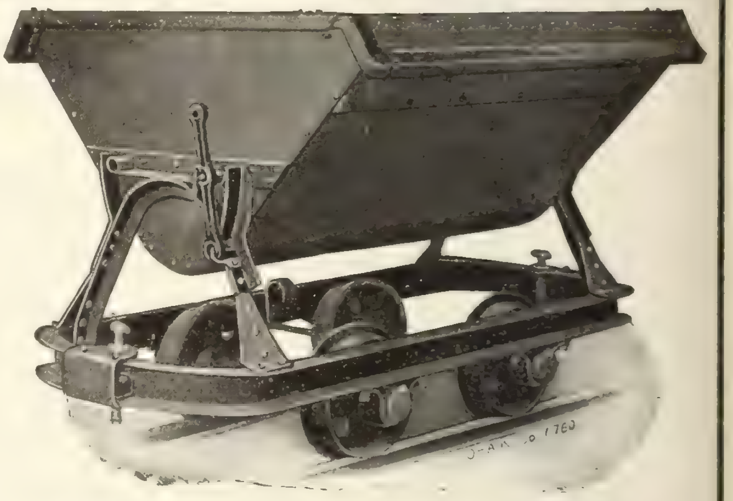
These cars dump very easily and discharge contents clear of underframe and rails. Owing to the great dumping angle, the box is completely emptied when dumped and can be placed in a slanting position when loading.



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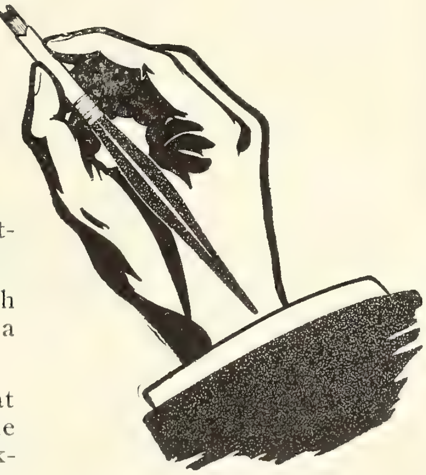

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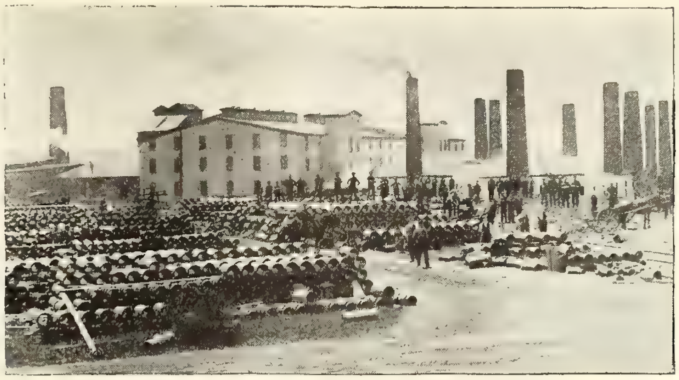

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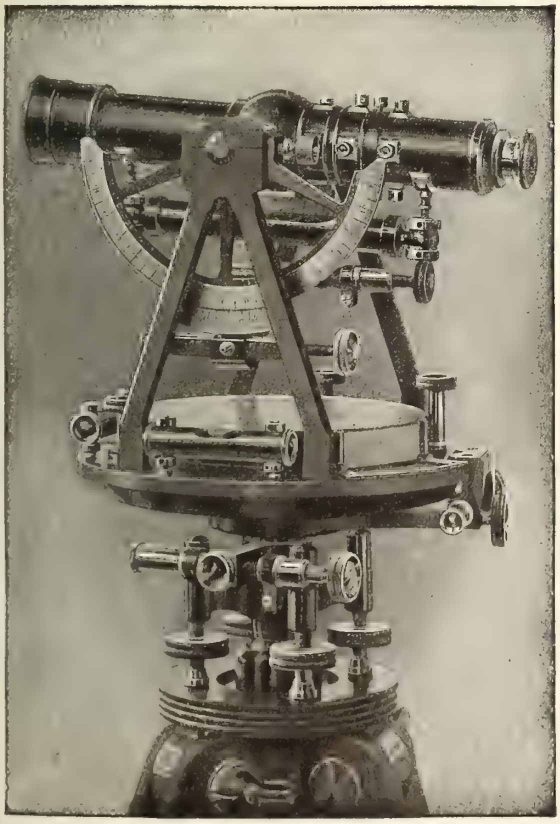

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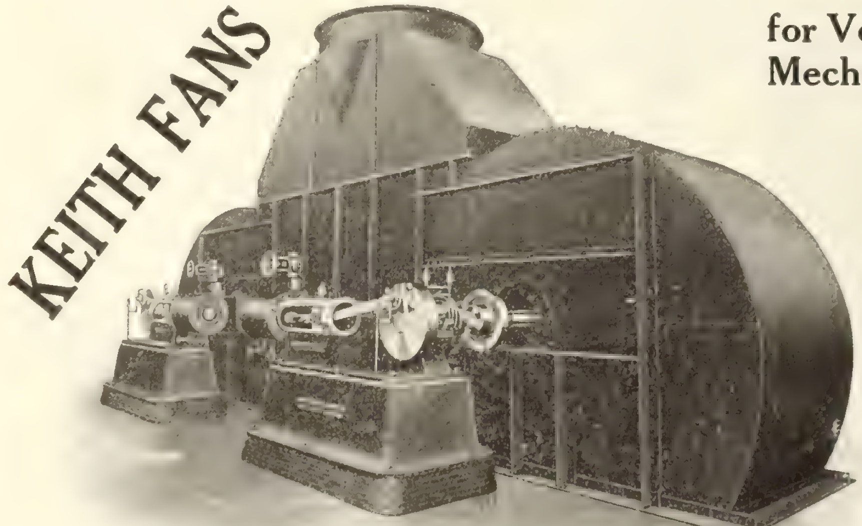

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THE above two brands of fumeless and non-freezing explosives are rapidly replacing nitro-glycerine and dynamite as blasting agents for work requiring high explosives.

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For Limestone, Marble and Sandstone

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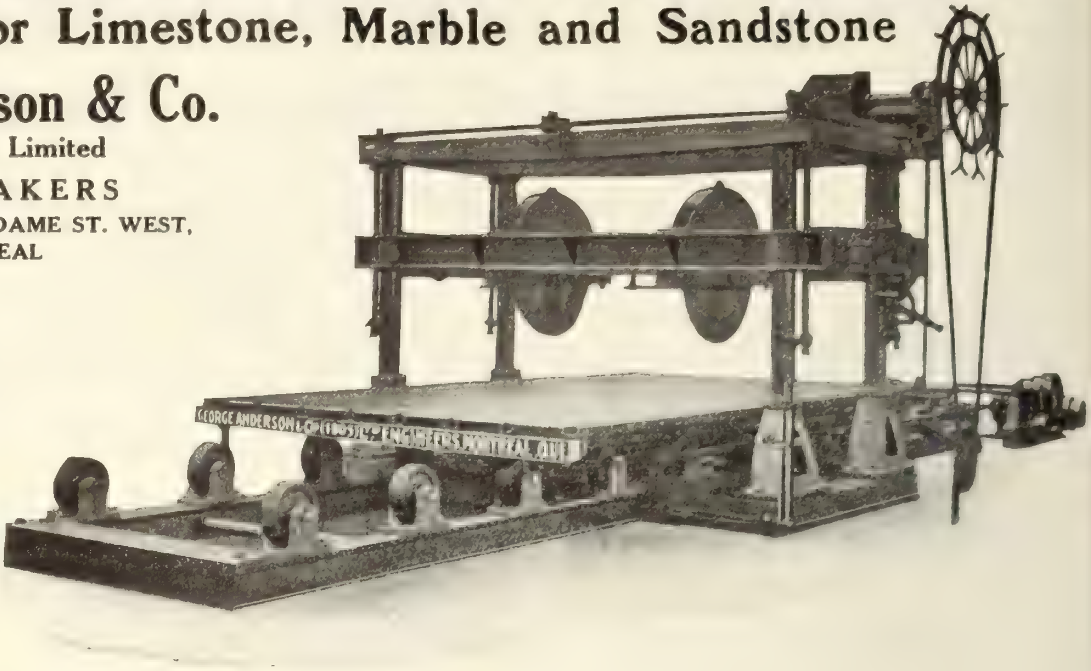

Anderson's Rising and Falling Diamond Saw, made under British and U.S.A.
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About 50 of the above Machines at work in Canada

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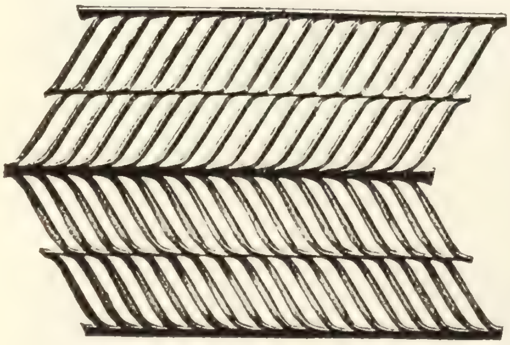

is built by nailing Herringbone Metal Lath to the outside of the wood frame and then plastering with cement plaster, both sides of the lath, leaving the studs exposed inside. Such construction is fireproof, weatherproof, ornamental and durable.

Why use Herringbone?
Because you can then space your studding sixteen inches apart.

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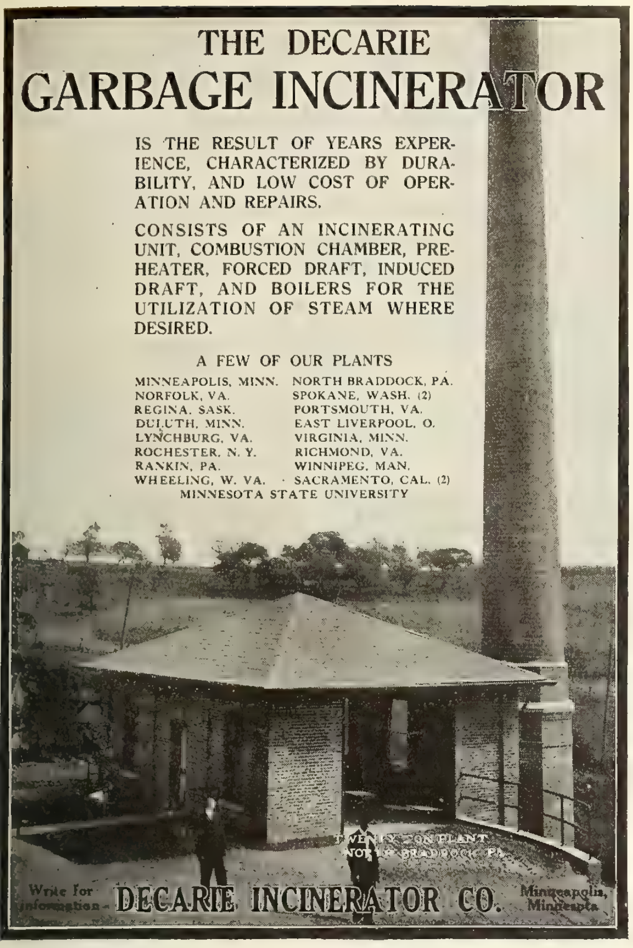
The Metal Shingle & Siding Company, Manufacturers



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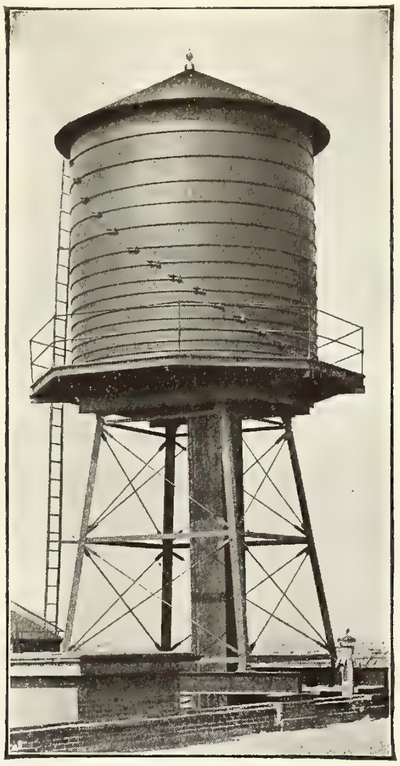

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Some of them are practically new, and they are all in good order, and if you want a second hand boiler, this is a particularly good opportunity for you.

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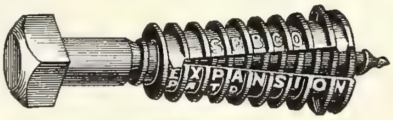

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of fastening fixtures and apparatus to concrete, brick or stone, than by using SEBCO Expansion Bolts. They are so constructed that when bolt is tightened, the inner end of the shield expands in the hole in which it has been inserted, embedding itself firmly in the surrounding material. There is no play or movement of any kind and the fixture is held tightly and permanently in place.

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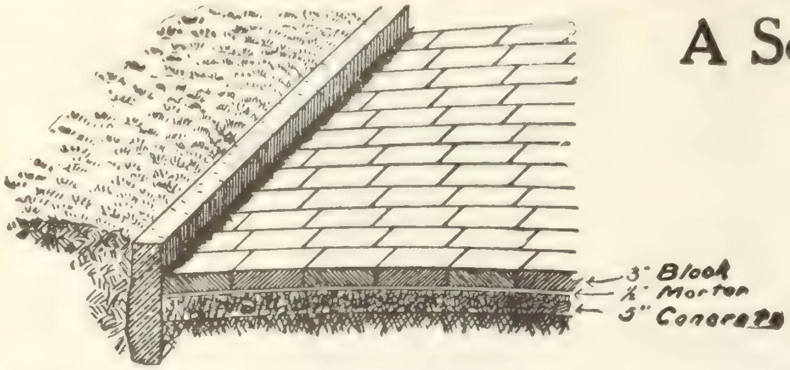

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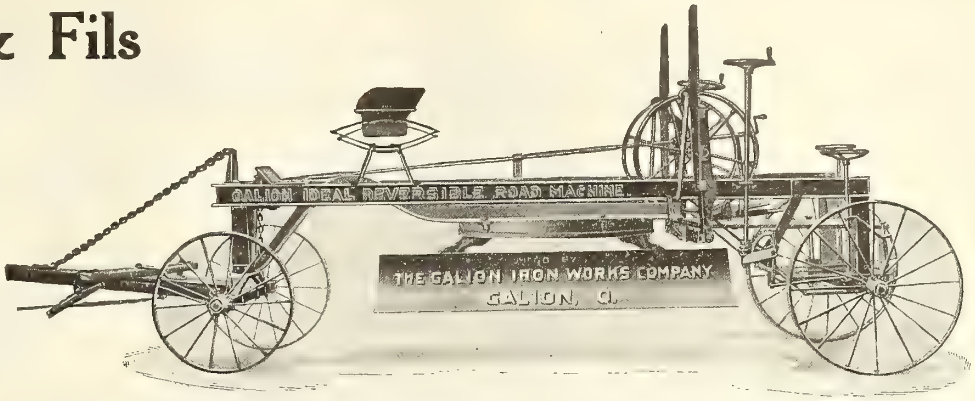
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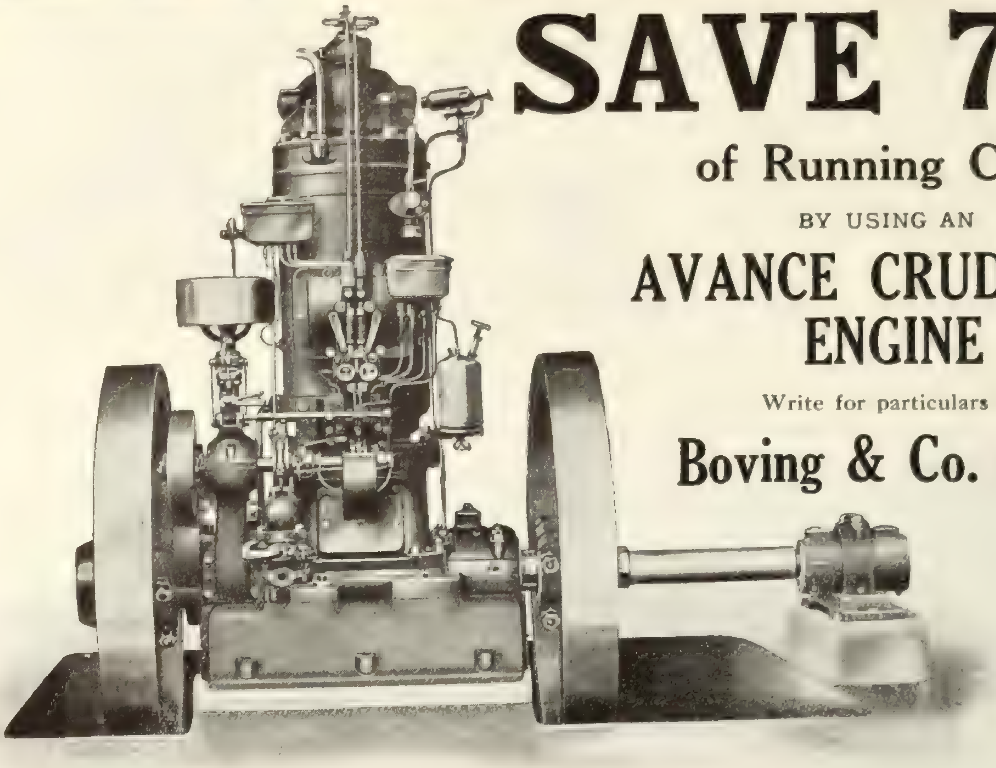

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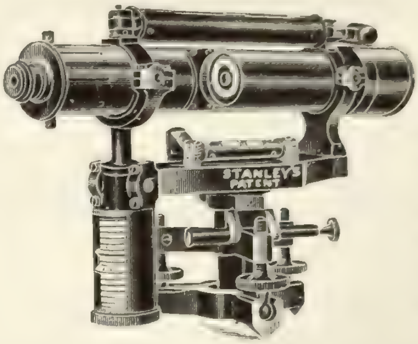

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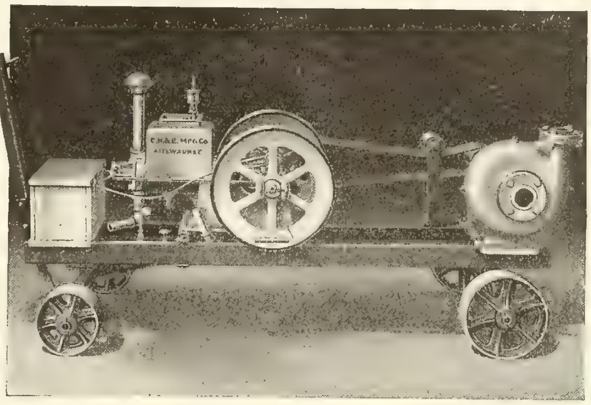
Where a greater capacity is required over that of the Bilge Trench Pump, this Centrifugal Power Driven outfit will fill the demand.

For irrigation purposes a centrifugal pumping outfit is the only proposition which will give continuous service.

The outfit shown here has a capacity of 6,000 gallons per hour.



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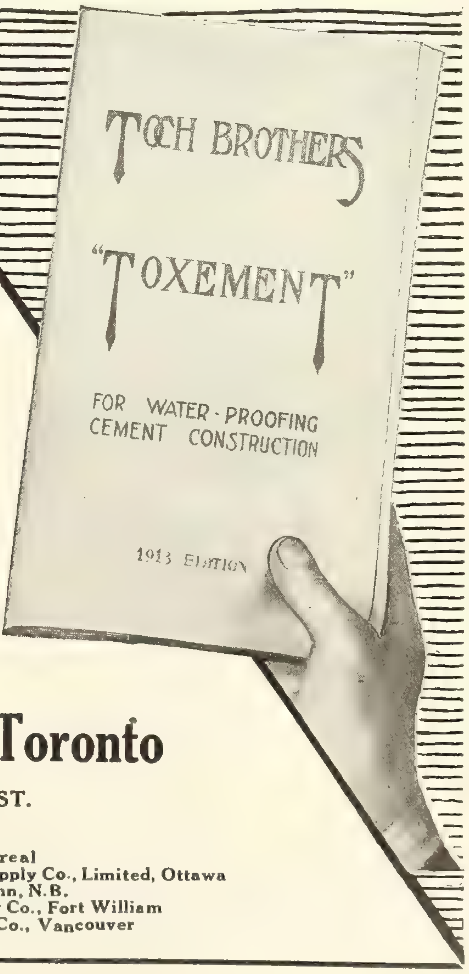

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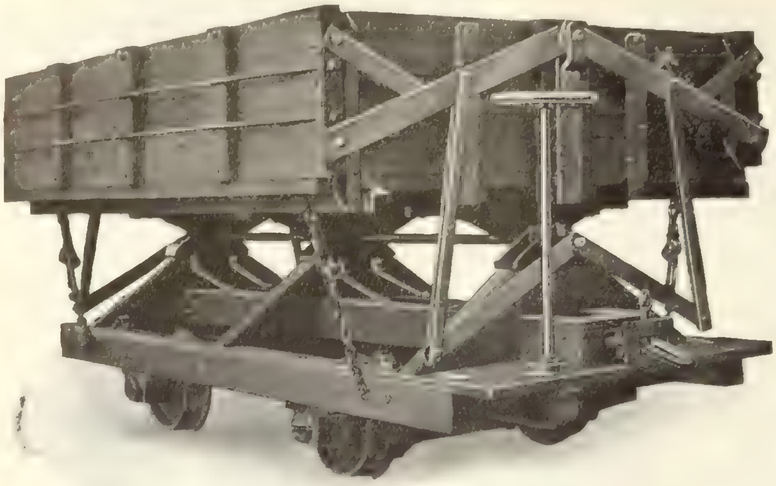

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Equipment is used on all the Largest Contracts

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Our product consists of Wood and Steel Frame Side and End Dump Cars, End Dump Grasshopper Rock Cars, Wheel and Axle Setts Boxings etc.

"Glengarry" Standard Wood Frame Dump Cars

have the strongest box and frame construction of any cars on the market. Note the double bracing of angle irons at corners of box. Under framing of box is especially designed to reduce working strains. Box is immediately removable from frame for transportation. They are shipped knocked down and load many more to a carload. All iron work and parts interchangeable on any car. Excellent door action.

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The Thew Shovel for Road Construction

The general use of the Thew Shovel in road building and street grading is conclusive proof that it is adapted to the conditions, economical for the purpose and efficient in operation. The following list of some of the contractors, in the State of New York alone, who have used and are using The Thew No. O Full Circle Swing Shovel in this class of excavation will indicate the popularity of the machine and its undisputed merit on such work :

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The Thew Shovel is popular because it can do the work.

There is no other shovel of equal weight and dipper capacity that can handle as difficult material, nor under equal conditions, as large an output as the No. O Thew.

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THE THEW AUTOMATIC SHOVEL CO., Lorain, Ohio

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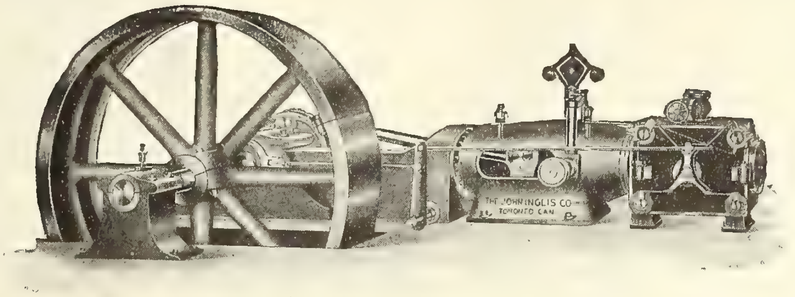

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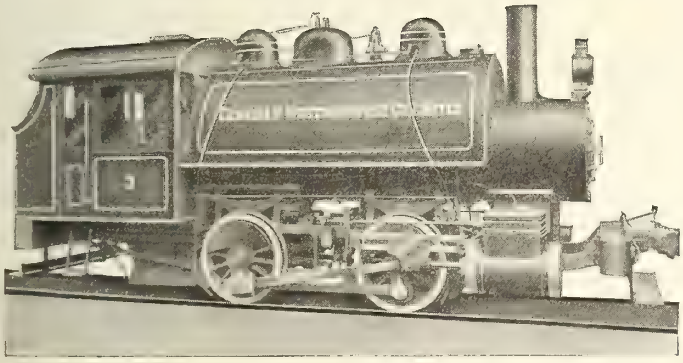

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Contractor's locomotives face different conditions. They must work day after day in the hardest service, and often in localities where repairs cannot be made without great inconvenience.

When you want a locomotive you cannot afford to overlook the experience of this company.

Experience in building large locomotives is invaluable in connection with the design of smaller ones in order to insure reliability, which is the main question in contracting work. You know what delays cost you.

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Concrete Tampers
for all kinds of concrete work

Made with strong cast iron bases in following sizes :

6" x 6" — 8" x 8" — 10" x 10"

and can be supplied with wood or gas pipe handles.

Our prices are lower than can be procured elsewhere and we can supply them in lots of one dozen or by the carload.

Made in correct shapes and are strong and durable.

Let us quote you prices.

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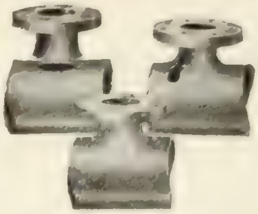

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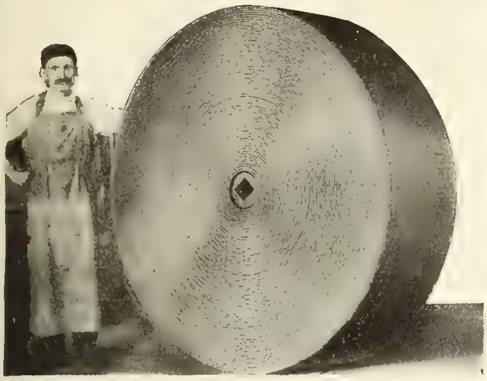


Goodyear Conveyor Belt for the Rainy River Gravel Co., Vancouver. Made in one piece—seven hundred and fifty feet long.

GOODYEAR

SPECIAL BELTS for Special Purposes

GOODYEAR IMPERIAL HIGH-SPEED BELTING

FOR high speed a High Speed Belt should be used. Great strength is demanded. A belt that is to grip a small pulley and transmit high power must be specially built for the purpose. It must resist the strong tendency to slip on the small, rapidly-revolving pulleys.

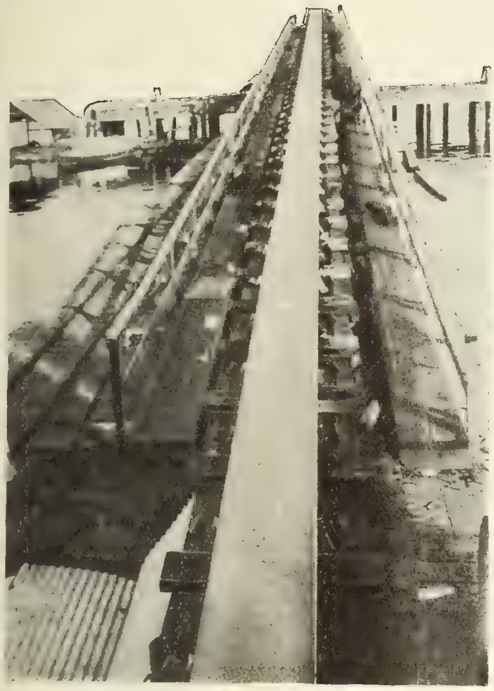
This Goodyear High-Speed Belt is made with a friction surface that grips the face of the pulley—conveying all the power.

It gives long service. The belt is durable because there is no internal friction—no ruinous grinding. That is where the Imperial High Speed Belt excells. It flies around a small, high-speed pulley without setting up internal friction.

In Goodyear Belts the elimination of all stretch, and the solid cohesion of duck and rubber, prevent any movement within the belt. Thus the belt gives long service and efficient service.

ELEVATOR BELTS

Elevator Belts are a Goodyear Specialty. The essential requirement in these belts is strength—and Goodyear Elevator Belts have it. That is why they are in constantly increasing demand. The buckets do not pull out. Long wear in the belt is assured because the plies of fabric do not separate in service. Goodyear Rubber Belts are used in hundreds of elevators throughout Canada.



A seven hundred and fifty feet Goodyear Conveyor Belt in actual service at Rainy River, Vancouver.

CONVEYOR BELTS

Where a sound and reliable belt is needed for hard service—for the conveying of stone, grain, ore, coal, etc., a Goodyear Conveyor Belt specially made for the work is the best investment. The Goodyear Conveyor Belt has a rubber face of great toughness, which prevents cutting and chipping, and increases the life of the belt. Not affected by weather. We make Conveyor Belts to any specifications. No better conveyor service can be given than that obtained from a Goodyear Belt.

ENDLESS BELTS

We make Endless Belts to order in any width, length and thickness—and for any purpose.

Part of an order of fifty rolls of Elevator Belting for the Saskatchewan Government Elevators.

Send for our interesting book on the choosing of a Belt—you'll find it useful. It is free.

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Roman Stone was used throughout this Church for the Rose Windows, Tracery, Arches, Balustrade, Turrets and Coping, &c. The work speaks for itself. For Churches and Public Buildings "ROMAN STONE" is rapidly replacing all other stone.

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The Conditions Under Which Our

Conveyor and Power Beltings

Are Made

Serve To Substantiate Their Superiority

Come with us on a mental journey through **our** Belting Plant, and see with your mind's eye the **unusual** precautions which we take to **win** and **hold** your confidence—to put **100%** of Service and Value in **each** and **every** Belt which we produce.

The Material Room

This is the material room where the various grades of duck are stored. Note its **fine** quality and the **immense** quantities which we have to purchase in order to cope with the demand for our Belting. Each **foot** of this duck has been **examined** by experts and the pieces which showed even the **slightest** imperfections, have been **discarded.** Even the **unseen** parts of our Belts are 100 per cent. Perfect.

Drying the Duck

The Duck is first sent to the drying room in order to prevent against any **possibility** of moisture remaining in it. When this precaution is **not** adopted the belts crack, stretch and break. **All** our duck is thoroughly dried before use.

The Frictioning Machines

Watch them putting the duck—from which all the "stretch" has been taken—through these huge frictioning machines. Note how these heavy steel drums drive and force the high-grade rubber stock, at **tremendous** pressure, through every strand and fibre of the duck. See how **carefully** the frictioned duck is **examined** for imperfections—flaws **can't** possibly pass unnoticed.

Cutting the Frictioned Duck

Here is the frictioned duck going through the cutting machines. Watch **how** perfectly the guillotine-like knives do the work and how each strip is **closely** scrutinized for ragged finish. There is **no** chance for human carelessness to mar the perfect work.

Vulcanizing and Finishing the Belt

Having **stretched** the frictioned duck to the **limit** of tension—thus eliminating any sagging tendencies from the finished belt—it is then sent to this huge belt making machine. See how the tough rubber stock is evenly distributed over the surface of the frictioned and vulcanized fabric.

Those experts are examining it again for imperfections before it goes to the vulcanizing room, where it is vulcanized into a permanently solid piece. After that the belt is finished and is as nearly perfect as human ingenuity can possibly make it.

Let Us Make Your Next Belt. It is Sure to Give You Satisfaction

If you are not getting the service you should from the belting you buy, let us demonstrate what our Beltings will do. We would welcome an opportunity to prove that they possess greater TENSILE STRENGTH, FLEXIBILITY, GRIPPING POWER AND SURFACE TOUGHNESS, than the Beltings you are now using.

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"Crown Brands"

TRADE MARK

CROWN

Pure Gypsum Products

Crown Gypsum Company, Limited

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Insure your concrete or stucco against damage from moisture with

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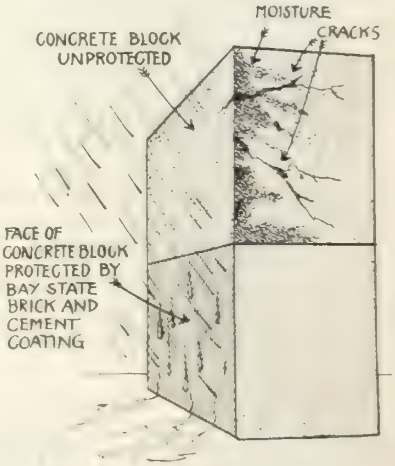
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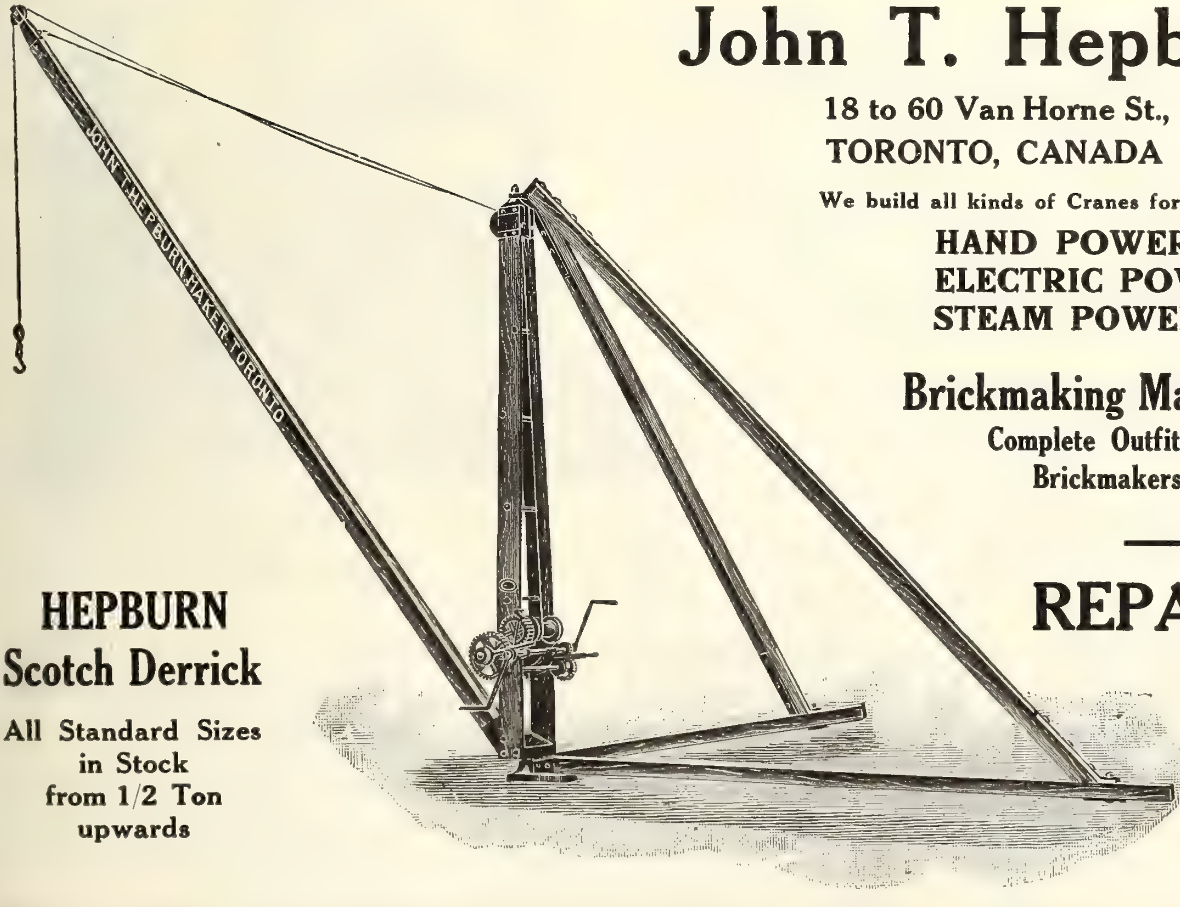
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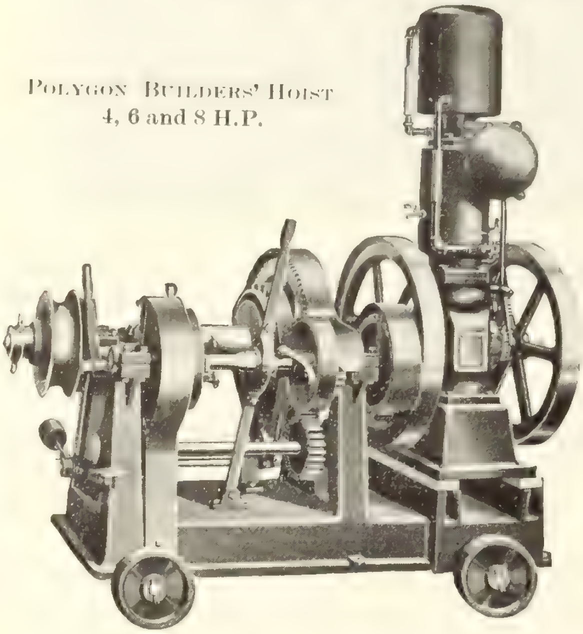

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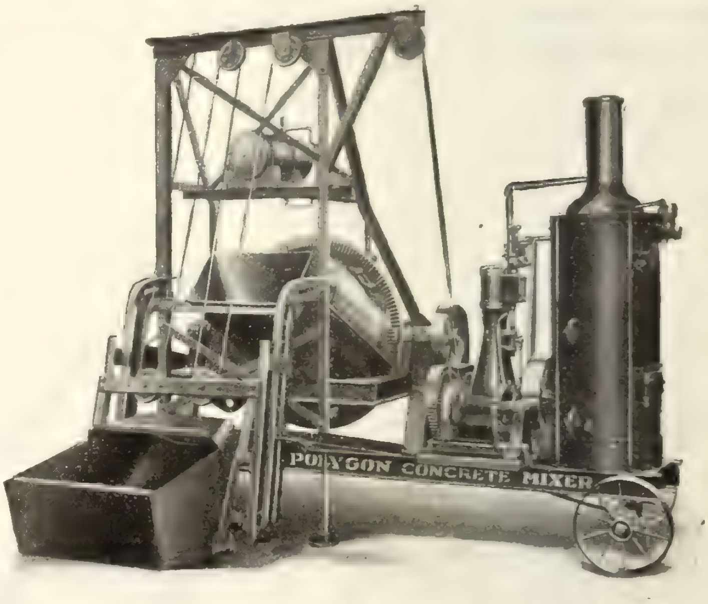

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Marketing Cement on the Bonus System

THAT there is a great variety in the quality of the various Portland cements placed on the market has long been recognized. These differences arise from the basic properties of the materials from which cement is made or from differences in the methods involved in the manufacture. The differences may be local in time as well as local in place. The run of the mill for one day may not be quite up to the run of a previous or succeeding day, owing to some lack of care or oversight in mixing, burning or grinding.

Attempts have been made to meet this condition and to enable the purchaser to pay not only for the quantity of material bought but also for the quality of the goods he received. Up to the present time these efforts have not been crowned with any marked success.

The method of procedure has been to fix a price for all cements conforming under test to certain standard specifications, and then to pay a bonus as these minimum specifications are exceeded by the cement in question. According to one plan the price was increased as an excess of tensile strength after seven or twenty-eight days' setting was shown. Then it was discovered that certain qualities of cement set quickly, but at the end of a year they were inferior in strength to some of the products setting less rapidly. Again, fineness was taken as a basis upon which to pay an increased price. Then it was discovered that fineness alone was not an adequate measure of strength. Up to the present then very little has been accomplished to make recognizable these differences in quality, because of a lack of method in measuring the extent to which one cement surpasses another.

Just now there is a suggestion emanating from Mr. W. C. Reibling in the Philippine Journal of Science, by which he proposes to enable the purchaser of cement to pay on the basis of quality as well as quantity. As formerly, the purchase will be made from the lowest bidder who guarantees to meet the specifications required and a bonus will be paid as the cement delivered exhibits superior qualities in several ways.

Unless the cement is suitably packed and show reasonable uniformity and pass the required specifications, including soundness after the steaming test, there shall be no bonus whatever.

It is suggested that a bonus be awarded if the specific gravity is consistently above 3.10 or the loss by ignition not greater than 2 per cent., and also if the residue on the No. 200 sieve is less than 15 per cent., and that on the No. 100 sieve is less than 3 per cent.

A recognition of tensile strength is made by paying a bonus for the product which has a gravity of not less than 3.10 and a loss by ignition not greater than 2 per cent., of which, in twenty-eight days, a 1:3 standard Ottawa sand briquette shows consistently an average tensile strength above 400 pounds per square inch.

It is claimed that the above system should satisfy both the manufacturer and the contractor. It requires special care in mixing, burning, grinding and packing but the bonuses involved in this superior article would more than compensate for the added trouble and expense in preparation. The contractor would have at his command an article fulfilling his requirements and therefore more dependable for his work. The method suggested is superior to the former methods in that it recognizes a greater number of qualities in the cement but is defective in so far as the payment is based on tests. It is well known that tests may be performed on the same material by different persons with varying results, and moreover, tests have but a faint similitude to working conditions.

It is only as knowledge of the properties of cement increases and the relation of test results to working conditions become more fully known that payment on this basis will ever become possible.

Treatment for Decaying Stone

NATURAL stone as a building material has largely passed out of use in the Dominion of Canada, its use being restricted for purposes of ornamentation in more imposing structures or for the purpose of constructing large public buildings. While this may be true we have many buildings, heirlooms of the past, built entirely of stone or with stone foundations, in which the material used shows a tendency to decay and crumble away. Most people labor under the impression that stone possesses all the characteristics of the eternal ages and consequently pay but little attention to this part of the building and are somewhat surprised to find that the process of decay has set in.

Methods for the prevention of this condition have been evolved along two lines. They consist in the use of solutions, some of which are considered reconstructors and others merely as fillers and binders. The method of applying these solutions is the same in both cases. The first step consists in removing from the surface by means of a stiff brush, steel tools should not be used, all the decayed material. Then the loose joints are carefully raked out. If the surface of the stone has become coated with bituminous matter which cannot be easily removed, a jet of steam will probably prove effective. Having carefully prepared the surface of the wall the open cracks are filled with hydraulic lime mortar and where the cracks are large, hard well burnt tile is inserted to prevent too large masses of mortar occurring in one place.

The solution to be applied depends upon the nature of the stone to be treated. If there is a large percentage of lime the wall should be repeatedly washed, as many as fifty times if necessary, with a solution of hydrate of barium. This solution is made by dissolving one pound of crystals in a gallon of soft water and has been known to penetrate the stone to a depth of three-eighths of an inch within a month. Two other solutions acting as binder and filler rather than as a reconstructor are sodium silicate (water glass) and sodium arsenate. A coating of lime wash from fresh lime and hot water applied two and three times with any required coloring, forms an excellent general preservative.

Building Inspection

THE leading cities on the continent are doing their utmost to provide building codes which will provide safety in construction and sanitary conditions. In most cases their efforts are successful and smaller municipalities are following the lead and applying the codes so far as their less densely crowded condition requires.

A building code may break down at three points. The requirements may be so excessive as to throw the building of business blocks and other large structures into the hands of wealthy corporations, and thus tend to limit the amount of building and increase rents and generally interfere with the business accommodation of the city. Again, building inspection may be of such a nature as to render almost futile any regulations adopted in a building code, or a municipal council may override the regulations which have been put into operation.

Assuming that a sane code has been adopted, its efficacy then rests upon the inspection and upon the action of the municipal authorities. Upon the building inspector rests the responsibility of carrying into successful operation any building regulations which may have been adopted in the city. Hence he should possess two characteristics prominently. He should know thoroughly the code and know with equal thoroughness the art of building and the material employed. He should be characterized by absolute integrity, and should remember constantly that he stands to safeguard the interests of humanity, to guard them against loss and catastrophy and by a careful enforcement of the sanitary regulations to aid in maintaining the health of the community. An investigation into the methods of inspection employed in one of the largest of the American cities showed, that owing to the dishonesty of the inspectors the building code had become practically futile and that the safety and health of the community had been greatly endangered. The work of inspection calls for the very highest type of intelligence and integrity.

Democratic institutions, while possessing many excellencies and coming as near as may be to the best form of government, nevertheless possess serious defects. One of these defects is the tendency of those seeking office to prostitute their position in order to gain public favor and not infrequently, in order to gain the support of some more or less powerful voter, councillors have exerted their influence to procure the setting aside of building regulations in return for the support of the individual for whom the regulations were abrogated.

While it is admitted that a certain amount of discretionary power with regard to the building code should remain in the hands of the municipal council, it is well that this power be rarely exercised and that the council lend its constant support to the inspector charged with enforcing the regulations.

In the investigations previously referred to the municipal council in one year made 350 exceptions to the building regulations, a condition which practically rendered the building regulations a farce.

Editorial Comment

IN this issue of the Contract Record we publish the general conditions for competitive designs for the new Departmental and Courts Buildings at Ottawa, together with a plan of the site which is to be cleared of its present buildings and a plan of the proposed arrangement of the new buildings. The matter is of importance to all interested in architecture and the building trades and will repay a careful perusal.

* * *

GYPSUM plaster possesses many characteristics which make it valuable as fireproofing material. It has a low heat conductivity. The heat penetrates it at such a slow rate that in fires of ordinary duration the metal would hardly get warm. It has no appreciable expansion under the action of heat and as a consequence no contraction and destructive cracking when water is applied in a fire. It does not burn or support cumbustion. It is light and has the required strength for use in partitions and column coverings against fire streams. It may be adapted to any form of construction and even when used in slabs may be cut or sawed to fit any desired location. It has the further qualification of being cheap.

* * *

A RATHER striking piece of reconstruction work has been accomplished in Tuscarawas County, Ohio. During the recent floods many bridges were destroyed in this county. One stone pier, however, was found to be intact but badly settled on one side. The foundations had been laid in the river bed in 16 feet of water. A diver was employed, who upon examination discovered that the pier was resting uniformly upon a bed of gravel. Instead of removing the entire pier, as is usual, the upper part only was removed to a plane 24 inches below the surface. Piles were then driven in around the remaining part and on these piles a new foundation over and around the old one was constructed and upon this the material of the old pier was reset. Neither cofferdam nor excavation was necessary as a tight foundation form properly braced contained the concrete which was deposited under the water. The method proved both effective and cheap.

Building Tor Hill Reservoir, Regina

Position and Capacity—Excavations and Embankments—Details of Structure — Method of Operation — General Information

By R. O. Wynne-Roberts, M. Inst. C.E., M. Can. Soc. C.E., F.R. San. Inst., Consulting Engineer, Regina.

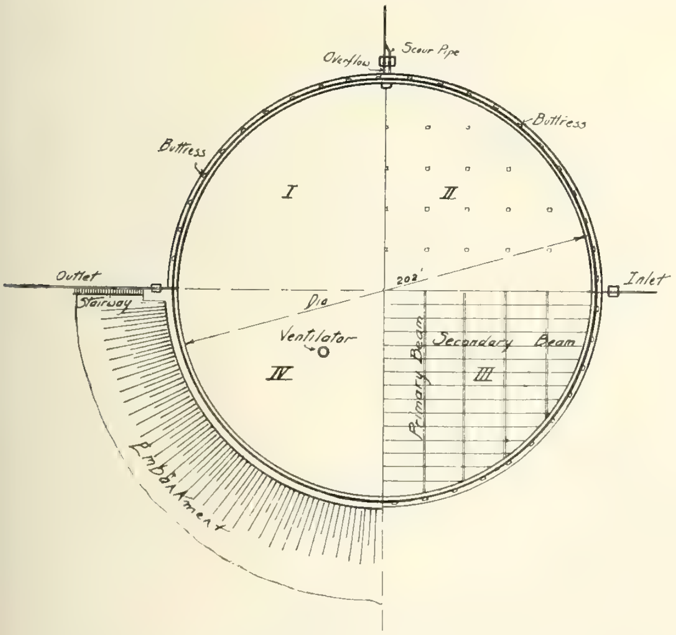
THE City Council of Regina on the recommendation of Mr. A. J. McPherson, then City Commissioner, now Chairman of the Provincial Board of Highway Commissioners, decided to adopt a scheme which the writer had submitted, whereby an ultimate daily supply of ten million gallons of water can be made available, at an expenditure of about $2,000,000.

The scheme included two five million gallon reservoirs. The construction of the first of these was commenced last summer, but owing to the unforeseen delays in the supply of certain materials, it was found impossible to complete the work before the winter had set in. Immediately it was safe to proceed in the spring the structure was finished as quickly as possible. The reservoir has been in use some three months and no signs of defects have been observed and the depth of water has been maintained at about 23 feet for nearly a month.

Tor Hill reservoir is 202 feet in diameter, holds 25 feet depth of water, and its capacity is five million imperial gallons. This reservoir is circular in plan, built of reinforced concrete, and is located on a hillside close to Boggy Creek waterworks, at an elevation of about 105 feet above the city; the top water line is about 120 feet above Regina level. It is so situated that it will answer in connection with future extensions of the water collecting works into five other watersheds.

Excavations and Embankment

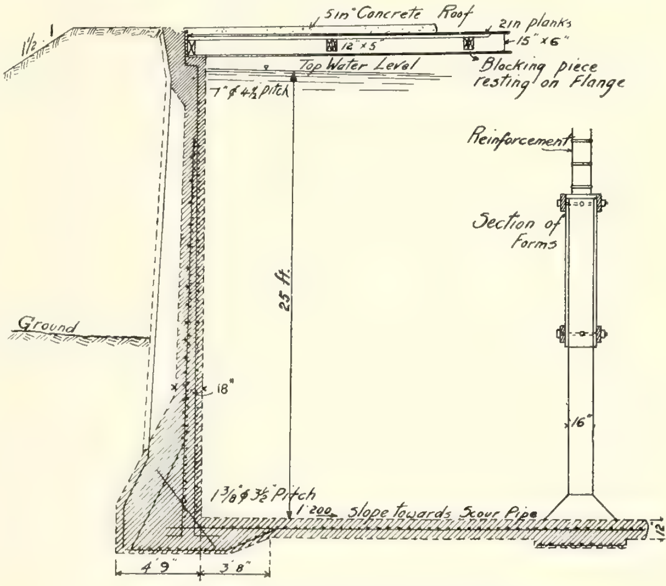
The following is a description of the work as carried out: The excavations averaged 9½ feet deep, the material removed was of a heterogeneous character common to glacial formation, ranging from fine sand to heavy clay. This was excavated by horse drawn wheel scrapers and the material deposited at convenient points, to be afterwards utilized in forming an embankment round the reservoir. In this work ordinary scrapers were employed. The quantity handled was about 12,500 cubic yards.



General plan :—I. floor and walls; II. columns; III. roof beams; IV. roof cover.

Footings of Walls

The footings were first laid. They are one foot lower than the underside of the floor, except where the pipe connections are located, here the thickness was made two feet beneath the underside of the pipes. The footings extend for a distance of 3 ft. 8 ins. from the inner face of the wall under the floor and are reinforced with half-inch round bars laid radially and circumferentially, and also diagonal brace laid radially, at six inch centres so as to form a strong tie between the wall and the floor.



Section through wall, roof and bottom.

Floor

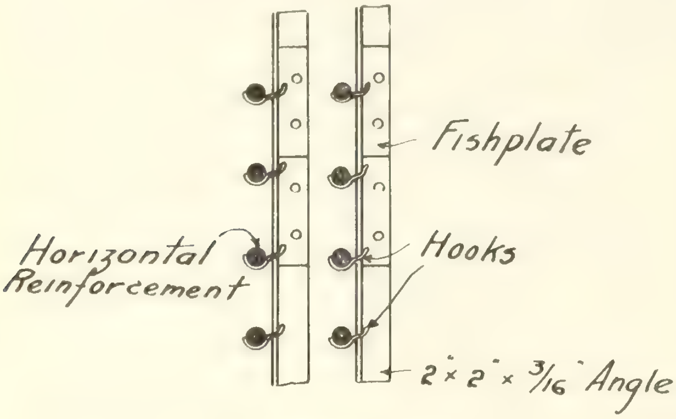
The reservoir floor is twelve inches thick, having a crossfall of one foot to the scour pipe, which is laid to a sump-hole at a depth of 2 ft. 3 ins. below the floor level. The floor was laid in two layers, each six inches thick, and between them were laid half-inch mild steel bars at six inch centres, in two directions, at right angles to each other, tied together at every fifth intersection in one way and at every intersection in the other direction. The top surface of the concrete was worked to a fine close texture.

Columns

There are 69 reinforced concrete columns, each 16 inches by 16 inches supported on truncated pyramidical bases 4 ft. by 4 ft. and 1 ft. 3 ins. high, which with 6-inch sub-base form an integral part of the floor. The sub base was reinforced with half inch bars laid at [illegible] inch centres in cross directions.

The columns are reinforced with four ¾-in. round bars tied by 1-in. by 1/16-in. hoop iron links at 10 in. intervals. Where the bars join the base they are inserted into wrought iron tube sleeves one-quarter inch larger in diameter and grouted with neat liquid cement. After the bases had set these rods kept the forms from rising when they were filled with wet concrete.

The forms for the columns were made in three sections built of two inch planks with 4 in. by 4 in. cross pieces at three feet centres and held together by 5/8-in. bolts. Each section was numbered so that the forms made a complete column. Sufficient forms for twenty columns were made and these were therefore used at least three times. These forms were assembled on the ground and hoisted up and lowered over the rods by means of a light gin pole on a monkey derrick built on skids. Lumber 2-in. by 8-in. was used to build up the derrick and this was moved from column to column by the men. The columns were braced by one inch boards tied to the wall forms and were plumbed to assure the perpendicularity of the lower forms; the other forms were held in place by two bolts holding the second and third sections down to the one already filled in. One section about 9 feet high was filled each day.



Standard and hooks.

Wall

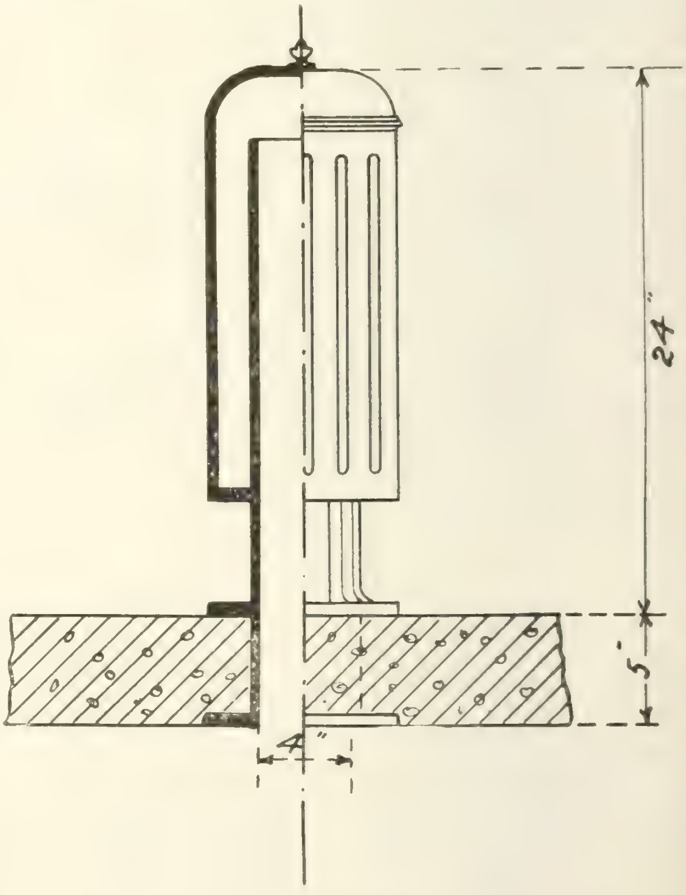
The wall is 57 inches thick at the floor level, while seven feet above the floor a steep batter on the outside reduces it to 18 inches, and from this point it tapers to 14 inches at the top water line. The wall then corbels out to allow a base for the roof beams and for a rain water gutter. In the original design the wall was to be 9 inches thick at the top and 14 inches at a height of 5 feet above the floor, with three external reinforced concrete rings placed at points of equal pressure, to provide extra strength, as the work would be carried out under somewhat unusual conditions, but, owing to the delays already mentioned, it was deemed expedient to alter the design by eliminating the rings and thickening the walls by an equivalent volume of concrete and steel, so as to simplify the construction and thus expedite the work. The inside face of the wall is vertical.

The horizontal reinforcement in the wall was designed to take up the tensional stresses proportional to the varying depths of water. At the floor level there are two 1¾ in. round bars at 3 in. centres, curved to template to fit the curvature of the wall, and at the top 1 in. at 4½ in. centres. These bars are held in place by 2 in. by 2 in. by ¼ in. angle steel standards in which holes were drilled at prescribed distances apart and ¼ in. steel hooks inserted to clip the rods. Such standards are 3 ft. 6½ in. apart along the perimeter of the reservoir, and fixed so that there are 5 inches of concrete between the horizontal steel reinforcement and the water face at the bottom, and 3 inches at the top. This method of placing and fixing the horizontal bars, resulted in a firm and satisfactory frame work which could not be disturbed when the men were placing the concrete.

The vertical reinforcement consists of half-inch bars at 8½ in. centres and tied to the horizontals by black wire at every fifth intersection vertically and at each intersection on the fifth rows horizontally.

There are 45 buttresses spaced at 14 ft. 2 in. around the outside of the wall. These buttresses are 2 ft. wide and project beyond the 14 in. wall at the top about 11 ins. and die out at the base. These are reinforced vertically by half-inch rods, spaced 4 inches apart.

The walls, etc., were built in courses about 12 inches high. Every horizontal and vertical joint was thoroughly cleaned before the next layer of concrete was laid. Any concrete work which had been standing twenty-four hours or more, had the laitance removed by picks, wire brushes, and plenty of water, so as to ensure a thoroughly sound bond. The concrete was well worked into the spaces between the steel rods, etc.



Ventilator.

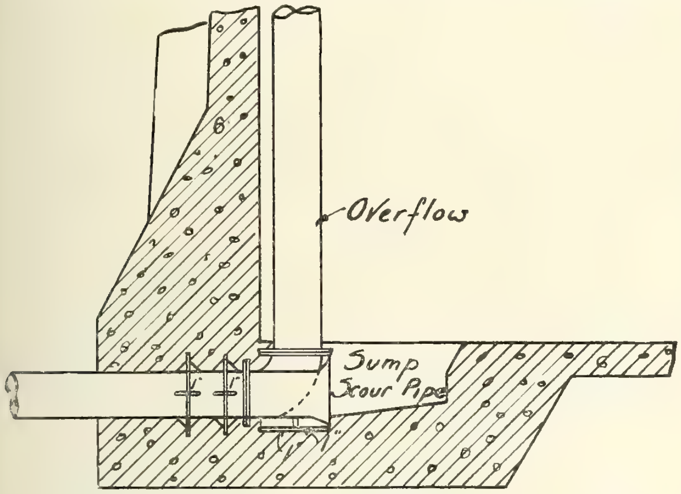
On the completion of the work, the wall, floor, and columns were painted with hot liquid bituminous asphalte and afterwards limewashed.

The timber work necessary to form the internal surface of the wall consisted of bents erected about 14 ft. apart, the girts were spaced every five feet and on each row of girts were placed 6 in. by 6 in. beams. The one facing the studding had a segmental piece nailed on to its face to form the curve. On the top of the 6 in. by 6 in. timbers was built the runways or gangways which served to transport the materials. As the wall was built up to the level of the runways the timber work was made higher so as to command the next tier of concrete work.

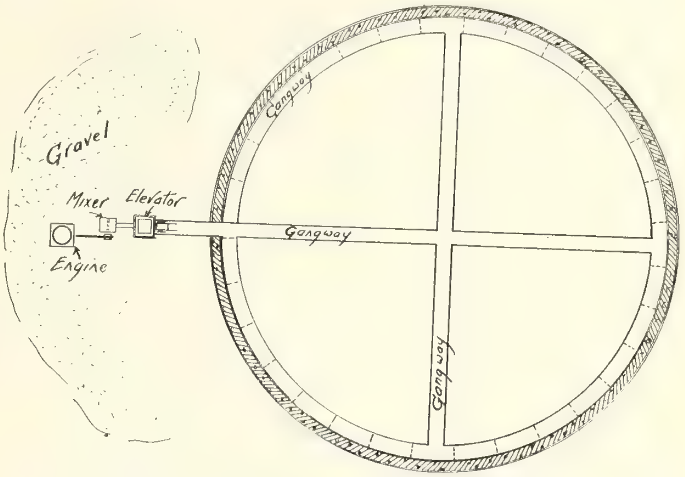
Roof

The roof is constructed of 15 in. by 6 in. by 60 lbs. rolled steel primary beams, cut to fit the 20 ft. spans and resting on the columns which are 20 ft. apart each way. The secondary beams are 12 in. by 31 lbs. rolled steel joists fixed at 6 ft. 8 in. centres and attached to the primary beams by angle iron brackets. The whole of the roof beams were rivetted together. The cover of the roof consists of 5 in. concrete, reinforced with half-inch steel bars laid crossways at 6 in. centres. The roof has a dome formation, being twelve inches higher at the centre than at the perimeter. The surface of the concrete was washed with hot liquid asphalt to prevent its being disintegrated by frost.

Rolled steel joints were selected for the roof construction as it would otherwise mean erecting false timber work to a height of 27 feet to support the reinforced concrete beams. With the steel joists, however, the forms rested on the flanges and this was a simpler and equally effective mode of construction.

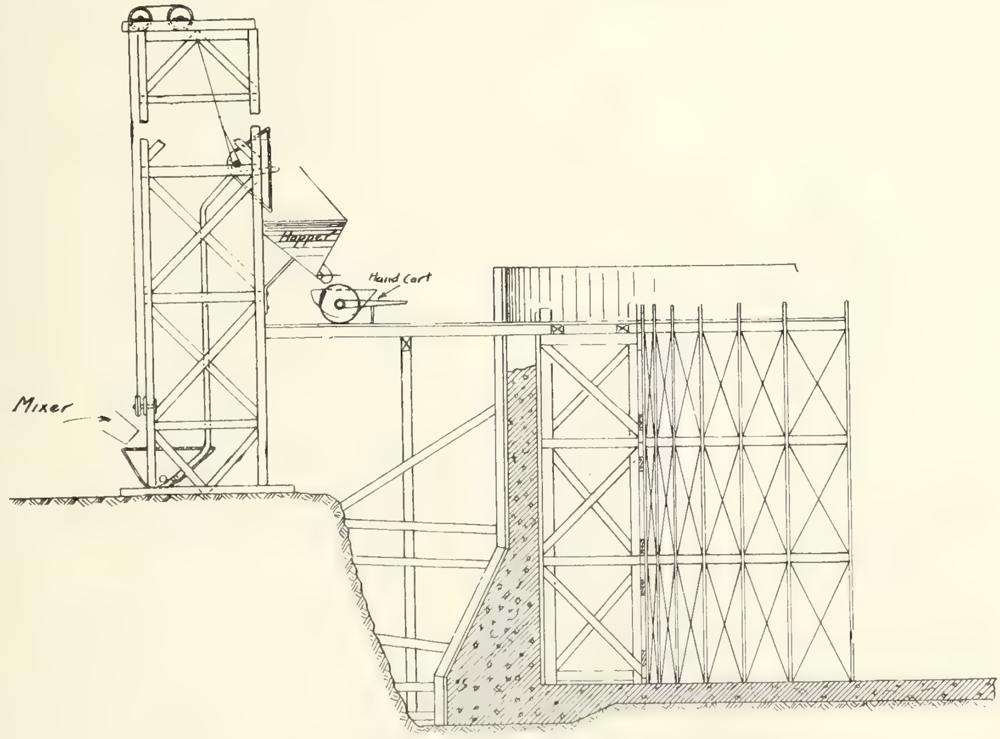


Overflow and scour pipe.



Arrangement for making and transporting concrete.

The steel joists were elevated to the roof level by means of a fixed boom attached to the hoisting tower, which was used to raise the concrete and then landed on loose dollies and run within reach of a derrick. This placing derrick was built of 6 in. by 6 in. tim-



Staging for transport of concrete and holding of forms.

ber in the form of a double boom traveller, having a reach of 60 ft. when both booms were spread. It was slided along greased rails and carried a set of chain blocks at the end of each boom. There are four cast iron ventilators in the roof.

Pipe Connections

The 16-in. inlet and outlet pipes are placed diametrically opposite, and the overflow stand pipe, and the scour outlet which are together, are located halfway between the inlet and outlet. The overflow stand pipe is held in place by 4 in. by ½ in. stays anchored into the wall.

All castings fixed in the concrete were uncoated and had puddle rings cast on, to prevent any water finding its way along the outside of the pipe. These rings are 6 inches wide and 1 inch thick, strengthened by brackets 1 in. thick. All inside pipes have bellmouths. The inlet and outlet pipes stand 6 inches above the floor level.

All valves are located outside the reservoir, and enclosed in reinforced concrete manholes, measuring 3 ft. 6 ins. square at the top, and 3 ft. 6 ins. by 4 ft. 6 ins. at the valve level. The mains leading to and from the reservoir are of ample size to deliver at least five million gallons per day, and of such dimensions as to fit in with future extensions.

Wrought iron step ladders were built of 4 in. by ½ in. stringers, 18 inches apart and ¾ in. rungs. The ladders are fixed into the concrete work at the top and bottom.

Reinforced concrete stairways are built at opposite points of the diameter to afford access. Stringers, 5 ft. apart, 15 ins. by 6 ins., and the treads are built monolithic and reinforced with half-inch rods lengthways and crossways.

Steel Reinforcements

All bars or rods are medium steel, having an ultimate strength of 60,000 pounds per sq. inch, and an elastic limit of not less than one-half of the ultimate strength, and elongate not less than 22 per cent. in eight inches and bend cold 180 degrees round a diameter equal to the thickness of the piece tested, without fracture on the outside of the bend.

Steel bars were joined together by overlaps equal to forty times their respective diameters and tied with black wire. The working stress on the steel was limited to 15,000 pounds per square inch tension.

Portland Cement

All the cement had to comply with the specifications prepared by the Canadian Society of Civil Engineers as revised in 1911, and the methods of testing were as near as possible those referred to in such revised specifications.

Concrete

The concrete was specified to be as follows:—Floors, columns and wall, three parts of broken stone and gravel, one and one-half parts of sand and one part cement. The mass work round the pipes, in the valve chambers and in the roof cover were to be four, two and one respectively.

The pit gravel obtained close by, however, was found to conform fairly close to the specified proportions that a mixture of one cement to five pit gravel was substituted, care being taken to add more cement when necessary. About 3,400 cubic yards of concrete were laid. The limiting compressional stress in concrete was 500 pounds per square inch.

Mixing and Placing Concrete

The concrete was mixed in a ¾ cubic yard Smith mixer, steam driven. It was mixed wet and was elevated by means of an Insley automatic roller hoist from the bottom into an Insley receiving hopper at the top, situated a few feet above the level of working operations from time to time. The concrete was then discharged into hand drawn concrete hopper carts and wheeled over the gangways to all parts of the work. As the work proceeded the hoisting tower, gangways and forms were extended upwards.

Miscellaneous

A Ham Baker water level indicator is being fixed to indicate the varying water level and by electric transmission to record the same at the Barton pump house, half a mile distant.

A 20 in. by 10 in. Simplex Venturi meter supplied by Messrs. Francis Hankin & Company, has been installed on the delivery main to the reservoir and near to the above pumping station. This meter automatically records the quantity of water pumped and also registers the total valume.

The half-inch and ¾ in. steel rods were supplied by the Provincial Steel Company, of Cobourg, Ont.; other steel was supplied by the Western Steel and Supply Company of Regina; cement by Canadian Cement Company, Calgary; cast iron by the Canada Iron Corporations; and the concrete machinery by Mussens Limited, Winnipeg.

Some Itemized Costs

The following are some of the itemized costs:—Cast iron pipes, class C, 2½ cents per lb.; special castings, 5 cents; cast iron covers and ventilators, 4 cents, all delivered Regina. Cement was $2.85 per barrel; steel, ½ in. and ¾ in. bars, 2.44 cents per lb.; 1 in. 2.80 cents; 1¾ in., 3.21 cents; 15 in. joists, 3.60 cents; 12 in. joists, 3.90 cents; standards, 3.90 cents, all delivered f.o.b. Regina.

Placing of steel in the columns average cost of labor was 26 cents per 100 lbs.; in floor 12 cents; in walls 30 cents.

Cost of labor, team and coal for mixing and placing concrete in column footings averaged $2; columns $10; floor 82 cents; walls $1.10 per cubic yard.

Generally

Tenders were invited for the construction of this reservoir, on the understanding that the city would supply all cement, gravel steel and cast iron work, with the result that the lowest bid was $63,176. The engineer's estimate was $46,497, to which was added $6,974 for contractors' profit, making a total of $53,471. The offers were considered to be too high and it was decided to carry out the work by day labor, under the superintendence of Mr. Herbert Gibson. The total cost was about $88,000, of which the items which the city would supply under the contract absorbed about $58,000. The modifications in the design and specifications no doubt effected some reduction in the cost.

Mr. Theo. Brockmann was resident engineer during the first season. Mr. L. A. Thornton the City Works Commissioner took an active part in the organization of the work, and Mr. J. McD. Patton followed by his successor Mr. J. Mackay, Waterworks Superintendent, attended to the matter of supplies of materials. The reservoir was designed and supervised by the writer.

Principles Underlying Scientific Street Design

By J. Russell Ellis, Assistant City Engineer, Regina, Sask.

THE subject of this paper has been chosen advisedly and with the knowledge that hardly any two highway engineers will concur in their methods of treating the points brought out. My greatest hope is that a thorough discussion upon the various features of the problem will be instigated, and that possibly the reading of the paper will assist in renewing the acquaintance of those present with the more or less familiar principles involved.

The problem of proper street design is as broad and varied as any problem could well be. If the matter were always handled in a scientific manner and by a skilled designer there would be little excuse for presenting this paper. Too often, however, are the very underlying and essential points in the problem which require study and skilled judgment arbitrarily fixed by the legally constituted authorities in charge without proper advice, thought or knowledge. We have probably all seen the street which is too narrow or too wide for the use to which it is placed, in the first instance permitting of insufficient roadway room or width of sidewalk or both, and in the latter case causing an excessive cost of maintenance or suffering for lack of the same. Even when the width of the street is satisfactory the location is often ill adapted to the fundamental requirements of the traffic to which it is subjected. Again, the width and arrangement of roadway, sidewalks and parking strips are stupidly fixed. Still again, the choice of elevation, gradients, kind of paving materials and facilities for storm water drainage are commonly noticeable as features of which improper treatment has resulted in inexcusable confusion.

Reconnaissance and Preliminary Survey

The first step required to be taken in dealing with the problem in a scientific manner is a reconnaissance of the territory tributary to the street. For the purpose of this paper it will be assumed that our street has already been laid out and various improvements made upon the abutting property as is the case nine times out of ten when the engineer is given a hand in the design. A map drawn to a fairly large scale—not less than one hundred feet to the inch—should be provided with the street lines and all abutting property divisions accurately shown. This should be used in conjunction with a small scale map if available showing the streets and natural topographical features in the section of the city or town which is traversed by the street under consideration. After a careful study of the maps, in which possible changes in width or location may be noted, the investigation will be carried to the field. Here all improvements along the street will be sketched in upon the large scale map in approximate position; any apparent diversion of traffic to other streets and the reasons therefore will be noted, and any obvious errors or omissions in the map lines or topography will be noted. The general character of the use of the contiguous territory such as business, manufacturing, residential, residential mixed with business and public use will be tabulated with the limits of each. Some study of the work involved in improvement such as the cutting down of hills and the bridging or filling of depressions should also be made. It will probably be possible at this time to make use of the conclusions drawn from the first study of the maps and to correct them where necessary. Along with these studies a reliable traffic census will be required. For this work it will be necessary to decide to what extent of detail the conditions will warrant the investigations to go. Various forms for recording the observations have been devised and rules established which are available for reference but need not be blindly followed. Certain it is however, that records should be taken at different times during the day, at different seasons of the year and during different conditions of the weather. Where heavy and fairly continuous traffic is encountered it will probably be advisable to have the reports cover the entire twenty-four hours of the day. Concerning the information necessary to record, Professor A. H. Blanchard, Columbia University, has made the following classification:

1. Differentiation between horse drawn vehicle traffic and motor car traffic.
2. Division of each of these classes of traffic into pleasure and commercial traffic.
3. Sub-division of commercial traffic into loaded and unloaded vehicles.
4. Determination of the weight per linear inch of width of tire of all types of commercial traffic.
5. Sub-division of the two classes of horse drawn vehicle traffic, dependent upon the number of horses.
6. Sub-division of pleasure motor car traffic upon the basis of weight and speed, since, in many instances, the greatest damage to certain types of roads is caused by seven-seat touring cars, limousines and laundaulets, travelling at speeds of 40 to 60 miles an hour.
7. Extraordinary character of local traffic; for example, traction engines, hauling trailers, motor bus traffic, ice wagons, mill drays, etc.

It would be well to remember, however, that this classification was made for the study of road design in general, and it seems to the writer that some modification might be made when considering street design alone. At any rate, it would be necessary to consider to what extent in any case it is practicable to carry the investigation. For instance, the classification number 6 might well, in many cases, be omitted, since it should be feasible to estimate an average weight and speed of the pleasure motor cars, considering that such cars are generally standardized as to weight and that the speed is limited by law. This average could be obtained accurately enough for our purposes, and would curtail the work involved in taking the census to a considerable extent.

From the data obtained in making these preliminary studies a general tentative plan can be made. This plan will include any changes in location from the original lay-out that may be considered advisable as well as any changes in width. The considerations governing choice in these respects will, of course, be the class and amount of traffic and the topography of the ground.

The next work in order will be the preliminary surveys to consist of a proper alignment of the street as decided upon for mapping purposes and the taking of elevations for cross-sections and profile. This work should be carefully and accurately carried out, and the records taken will in the end be used for estimating purposes. The methods involved in this work are simple and familiar to all engineers. Suffice it to say that sufficient levels are taken to determine accurately the amount of material necessary to be handled in grading the street for improvement and for fixing the grade to suit probable requirements and existing conditions. The plan and profile will then be placed on the same sheet of profile tracing linen. In general the scales preferable for use in profiles are forty feet to the inch longitudinal and four feet to the inch vertical. The scale for the plan will then be made to conform to the longitudinal scale of the profile, and the one will be placed directly below the other. With this data collected, we are now prepared to begin the detailed scientific study of the problem, and it is this portion of the work which is too often sadly neglected.

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* Read before the Regina Engineering Society, Aug. 14, 1913.

Traffic Data

The first consideration affecting the question of the proper width of the street should be its classification as regards present or probable future use. The usual classification is placed under three heads, viz.: main thoroughfares, secondary thoroughfares and residential streets. The classification may be carried farther under a number of sub-headings. The traffic census and an estimate of future development, after careful study of the tributary territory, will be used in making the classification. It will be necessary to determine as best we can what facilities will eventually be required for the purpose of rapid transit. In large cities and on certain streets our conclusions will cause us to provide for underground or elevated railways, in other places the surface street railway only will be necessary. With the estimate of the amount of this traffic it is not difficult to calculate the width necessary to provide for taking care of it. For instance, the width required for single track street railway operation is eight to nine feet and for double-track from nineteen to twenty-one feet. The general traffic should, as far as possible, be kept off the railway allowance. Other public utility accessories that present a probability of being required on the street such as pole lines, pipe lines, conduits, etc., will require consideration as to how much width will need to be excluded from other uses for them. Then the necessity or desirability of considering the ornate side of the problem as affected by planting spaces or parking strips should be given its proper place as going hand in hand with the scientific design. It may be considered that a width of four feet will be necessary for planting one row of trees, but the widths and arrangement of these spaces should not be fixed until after the width of roadway, sidewalks, etc., have been determined in order that the correct division or breaking up of the space may be made. It might be noted here that the practice of placing sidewalks against the curbs where the roadway is less than fifty feet in width results in an improper division of the space.

The width of roadway exclusive of street railway allowance is a vital feature of the design. This is the point where one of the greatest aids of the traffic census comes in though we will need to estimate the width that will be necessary for all future requirements as well as those of the present time. This may not call for the entire width being covered with pavement at first, but the estimated requirements should be provided for. After we have made a careful estimate of the amount and character of the traffic the problem of supplying the necessary width for its accommodation is of a more elementary character. It should be remembered that the principal purpose of the street is to provide efficient means for the necessary movement of the public and the opportunity for transporting the commodities required by it. To accomplish this necessitates providing the proper width to prevent congestion or inconvenience. We will need to fix a definite width to allow each vehicle on the street. Some authorities advise a width of eight feet, others nine feet. It would seem that on account of the tendency toward motor cars of wide bodies that where a preponderance of motor traffic is to be taken care of, the greater width should be used. Where it is estimated that most of the traffic will be composed of horse drawn vehicles eight feet is sufficient. For calculating the widths of sidewalks required two feet is assigned to each pedestrian. Care will need to be exercised here that places where many people gather and leave at certain fixed times do not over-tax the sidewalks. In all cases where feasible, however, the widths of the improvements necessary for the present use only should be adopted, with provision made for increasing them from time to time as needed.

Gradients

The question of limiting gradients requires to be gone into carefully. The points affecting our decision in this matter are the maximum loads to be expected in the street car, motor and horse drawn traffic, climatic conditions causing slipperiness, the damage accruing to existing improvements along the street by cutting below or filling above the level convenient for their use and, in some cases, the desirability of having the floor levels of large buildings at a distance not too varying from the street pavement. We will also need to begin thinking at this point about the class of paving materials that will be used in the construction, particularly with regard to their slippery tendencies. The grades should not be too steep to prohibit the ordinary desirable heavy loads being transported economically unless the interest value of the cost of reducing them including all damage to abutting properties would exceed the loss in cost of transportation. This problem should be figured out in detail where it is evident that large expenditures will require to be made in order to get the desired grades. In general we may consider that a maximum grade of five per cent. is a desirable limit upon heavy traffic streets, and this maximum should only be employed wherever absolutely necessary and at infrequent intervals. A possible way of reducing the rate of grade upon a street is to have the roadway wind from one side to another. This method when used will probably necessitate a greater width of street and a different arrangement of the parking scheme. In this connection it may also be well to consider making detours from the straight line in order that bad hills may be skirted instead of being crossed directly over their summits. By these means a considerable saving in steep grades may often be effected. The minimum rate of grade, too, depends upon the class of pavement used. It must be sufficient to allow prompt drainage of the surface water into the catch-basins. The expedient, however, of what is known as false grading in the gutters will allow roadway, curbs and sidewalks to be laid with a level longitudinal grade, if necessary, but the gutters will have to have sufficient grade to create a flow of water. The minimum grade for this purpose should in no instance be made less than four-tenths of one per cent., and this should be used as sparingly as possible.

Paving Material

The choice of kind of paving materials to be employed in the construction involves a great number of considerations which, however, can be investigated along scientific lines. Experience has already established that certain materials are undoubtedly best adapted for certain purposes, and the results may be made use of without further investigation. For instance, no one denies that Portland cement is the proper material for any permanent street pavement base and for the sidewalks, and the truth is equally as much evident that certain materials for the wearing surface of the roadway pavement are adaptable under certain climatic conditions, while not under others. In considering the pavement base, however, we shall need to design the thickness and proportions of the concrete to safely withstand the loads and stresses to which it will be subjected. Ordinary practice has held pretty closely to the limits of four and eight inches, varying with the nature of the traffic and the condition of the sub-base. It is advisable to make an analysis of the bearing power of the soil and the stresses which will be produced by the traffic in each particular case where conditions vary materially from other cases which have been investigated. The principal stresses induced in the base are due to climatic forces and the loads causing compression. Variation in temperature tends to cause disintegration by expansion and contraction of the concrete, and water tends to penetrate through to the sub-base, making it soft and reducing its bearing power. Therefore the base must be designed so as to expand and contract without breaking the bond, and the water must be kept out by an impervious surface. The loads tend to push the pavement into the sub-base, and hence the base must have strength and rigidity enough to distribute this force safely. In general the safe load which may be allowed for the sub-base is two or three tons per square foot. It is probably needless to say that the width of tires will be considered as to the manner of transmitting loads to the base.

In designing the pavement wearing surface for the roadway a greater number of considerations enter. First, in the way of stresses we have to consider forces caused by impact, shearing and suction as well as compression and temperature stresses. The forces caused by impact are received by the wearing surface only, and hence the wearing surface should have sufficient resilience to absorb these forces without damage. Standard tests have been devised for use in this connection. Shearing is induced by the tractive power of the wheels of a self propelled vehicle and the feet of horses. The wearing surface must have sufficient strength to resist this force, and must have stability enough to prevent its being torn away from the base from the same cause. Hence the study and testing of the bonding properties are obligatory. Suction forces result from the partial vacuum created behind a rapidly moving motor vehicle. The individual parts of the wearing surface must be held together in order to resist this force. Compression and temperature stresses will be handled in a manner similar to that outlined for the concrete base.

Second, a comparison of the value of the different wearing surfaces should be made with especial reference to cost, durability, maintenance, cleaning, traction resistance, slipperiness, sanitary qualities, noise and possibly other qualities made desirable by local conditions. The United States Office of Public Roads working along these lines some years ago collected reports from the engineers of a number of American cities. The results of this enquiry were published in the form of a table which is reproduced below. Under the percentage column the various qualities desired in a pavement are assigned proportionate values, the total being 100 points. The pavement ranking first under any given quality is given the full quality percentage, the rest grading down from this value in proper proportion.

Note.—Favorableness to travel is dependent chiefly upon smoothness and freedom from dust and mud, secondarily upon the qualities composing "acceptability."

Acceptability includes noise, reflection of light, radiation of heat, emission of unpleasant odors, etc. It chiefly concerns the pedestrian and the adjoining resident.

Cost per square yard includes concrete, but not excavation, curbing, etc.; except for macadam, which is not usually laid on concrete.

The table is not given here in order that the results shown may be taken as applying to any particular case, but merely to suggest the proper procedure for the investigation. In any one problem certain conditions of a local nature are bound to enter.

When the available and seemingly desirable pavement surfaces have been thus compared it will be possible to reject those which do not meet requirements and thereby reduce the field of investigation. With those which are considered suitable the final test will be that of economy. Careful estimates should be made of the initial cost, the annual cost of maintenance and the life of each. Then using the prevailing rate of interest with the amount of capital required to do the work we can soon determine which is the most economical material to use.

Parking Treatment

A vital feature in street design from the aesthetic point of view is the parking treatment. There is no doubt that the average engineer would benefit exceedingly in collaboration with the landscape architect in this phase of the work, when this is possible. Certain elementary considerations, however, may be kept in mind, and a careful study of this question should not be dispensed with.

It is desirable to have residential streets planted with trees and grass in the strips reserved for parking purposes. Ordinarily the most suitable plan to follow is to place these spaces between the sidewalks and curbs, between portions of the roadway pavement where the space is available and, where the building line is at or near the street line, to have a space between this and the sidewalk. Trees should be planted in straight lines as a rule, twenty to fifty feet apart in the row, and the grass should manifestly be carefully cultivated. The selection of the kind of trees will be governed by local conditions, but the rapidly growing varieties are generally preferable. Low, dense growing trees such as evergreens are not often suitable for the purpose. They should produce a good shade and be shapely, the size being regulated by the available space, and the proximity of buildings. It will be understood that certain varieties of trees will be unsuitable for urban planting on account of the condition of the atmosphere and the environment of surrounding improvements.

No one who is familiar with the methods of dealing with the various phases of the problem of street design as has been outlined will gainsay that no small amount of detailed effort will be involved in proceeding along these lines. It will be evident, however, that the results of the investigation of certain points will be applicable to the design of all streets in one town or city. Still other features will be similar when they apply to streets of like use throughout the municipality, and a majority of the results will coincide when relating to all of the streets of one classification within a limited territory. It should be borne in mind that the design of a street when once executed will be in a large measure permanent and that countless numbers of users far into the future will suffer from any of the original defects. The economical side of the problem alone should appeal to all citizens, for not only will traffic be inconvenienced and made more costly, but abutting and nearby property values will be affected, and the community as a whole will be the loser in proportion to the enormity of the defects.

After all, the principal considerations are practically fundamental. When the reconnaissance and the preliminary surveys have been made, and the observations taken and data collected for determining width, limiting gradients, kind of paving materials and parking treatment, the sound judgment and knowledge of the competent designer gained from study and experience enable him to evolve a correct, scientific plan. There can be no excuse for any other.

Conditions for Competitive Designs of Government Buildings, Ottawa

SOME time ago the Public Works Department of the Dominion of Canada decided to add to the present preliminary and departmental buildings and provide for complete departmental equipment and courts buildings. In the courts building it has been decided to provide for the Supreme Court, the Exchequer Court and the Royal Commissioners Court. The new buildings are to stand on a bluff of the Ottawa River and the west of the present departmental group. Mr. Edward White, the English landscape architect, prepared a ground plan which has been accepted by the Government. In order to provide for the necessary buildings it was decided to arrange for the submission of competitive plans and Mr. T. E. Collcutt, past president of the Royal Institute of British Architects, and of whom biographical reference was given in the Contract Record of July 9, together with Mr. J. H. G. Russell, president of the Royal Architectural Institute of Canada, and Mr. J. O. Marchand, A.D.G.F., member of the Royal Architectural Institute of Canada, were appointed assessors to draw up the conditions and instructions to the competing architects and to select from the preliminary sketches six designs. The authors of these designs are to be invited to submit final designs and each of the five unsuccessful architects submitting a design in accordance with these condition shall receive an honorarium of $3,000.

The undertaking involves the expenditure of a large sum of money. As public buildings it is eminently fitting that their aesthetic character be such that they stand a monument to the architectural taste of the Canadian people. Their construction should be such that while suggesting the purpose for which they were built, they combine strength and finish. As a matter then of interest, not only to the members of the architectural profession and the building and construction trades, but to the general Canadian public, we publish below the terms of the competition, together with plans showing the site as it is occupied at the present time and the proposed arrangement for the new buildings.

Conditions

Promoter—The Government of the Dominion of Canada promotes this competition and is hereinafter referred to as the Government.

General Plan—The Government invites Architects to submit preliminary sketch designs in competition for the erection of certain buildings, which are to be included in the scheme for the development of complete Departmental and Courts Buildings. The ground floor area of the Departmental Buildings must cover a space of about 200,000 superficial feet, this superficies to include all walls, outer and inner, corridors staircases, lavatories, etc., the entire scheme to be shown on the block plan together with the layout of the adjacent grounds as terraces, foot walks, etc., etc.

Buildings to be Erected at once—It is the intention to build at once a certain portion of this complete scheme, viz.:—The Supreme Court, the Exchequer Court, the Railway Commissioners Court, and the necessary offices in connection with these Courts, as hereinafter scheduled, also a block or blocks of Departmental Buildings covering a ground floor area of about 100,000 superficial feet and providing about 500,000 superficial feet of floor area, including all walls, etc.

Scheme of Site—A scheme dealing with the site which is acceptable to the Government is shown in enclosures No. 4 accompanying the conditions of the competition. This plan, however, need not be considered as a final solution of the question.

The Government desires the competitors to have a perfectly free hand in the development of their designs.

The above mentioned scheme has been published in the London and the Canadian architectural papers and at the same time there were published suggestions for the elevations, which were further illustrated by perspective views of the buildings shown on the plans. The Government disassociates itself entirely from these designs, and does not wish them to be considered as in any way representing its views or wishes.

Competitors—The competition shall be restricted to architects who are British subjects, practising in the British Empire.

Assessors—The Dominion Government has appointed Mr. T. E. Collcutt, Past President of the Royal Institute of British Architects, Mr. J. H. G. Russell, President of the Royal Architectural Institute of Canada, and Mr. J. O. Marchand, A.D.G.F., and a member of the Royal Architectural Institute of Canada, as Assessors to draw up the conditions and instructions to competing architects and to select from the preliminary sketches, six designs, the authors of which are to be invited to submit final designs and each of the five unsuccessful architects submitting a design in accordance with these conditions shall receive an honorarium of three thousand dollars ($3,000).

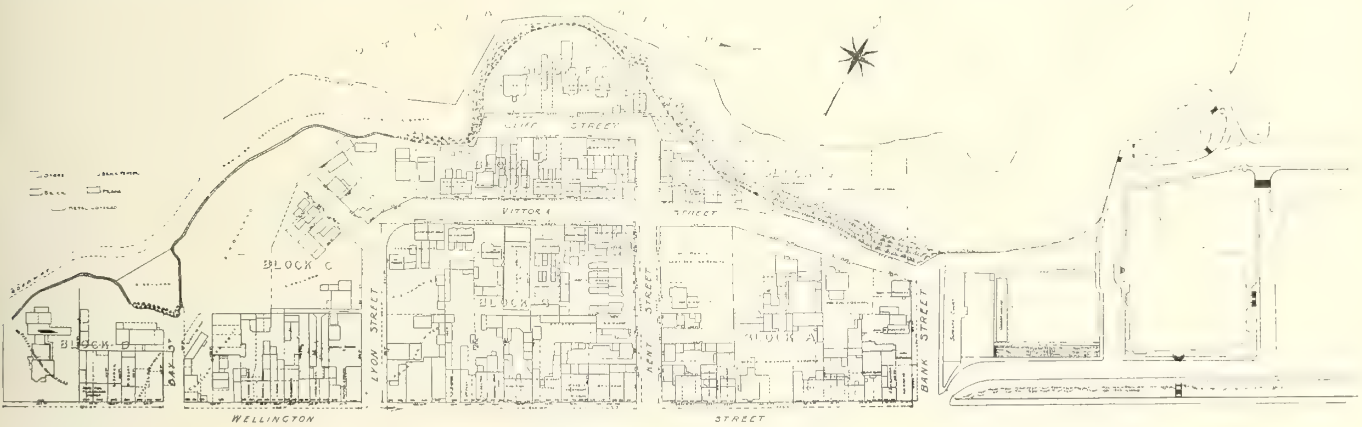
Restrictions—No promoter of a competition, and no assessor engaged upon it, nor any employee of either shall compete or assist a competitor, or act as architect or joint architect for the proposed work.

No competitor shall enter into association with any other architect unless such intention has been declared in the notification of the intention to compete and if such associates shall win the competition, they shall still continue their association.

Insurance—The Government does not accept responsibility for damage to any of the drawings submitted, but it will insure them from damage by fire while in its possession.

Delivery of Designs—The designs in the first competition must be delivered in Ottawa (carriage paid) not later than 12 o'clock noon, second (2nd) of January, 1914, addressed to the Secretary of the Department of Public Works, Ottawa, Ont., and any design delivered later than that date, shall be excluded from the competition, except only where delay is proved to the satisfaction of the Minister to have arisen in transit. The date for sending in the designs in the final competition will be determined hereafter, but a period of at least three months will be allowed for the preparation of such designs.

Award—The award in the preliminary competition will be made within twenty-five days of the date fixed for receiving the designs and a similar time will elapse between the time for receiving the final designs and the award to the successful architect.



The site as it is at present.

Return of Drawings—The whole of the designs submitted in the first competition will be returned to their authors and will be seen only by the assessors and the Honourable the Minister of Public Works and his Deputy. No description or illustration of these designs shall be published or in any way made public.

Exhibition of Designs—The final designs shall be publicly exhibited in Ottawa with the names of the authors marked thereon for seven or more days immediately subsequent to the award, and they shall be the property of the Government.

Enquiries—All enquiries regarding the competition shall be addressed to the Secretary of the Department of Public Works, Ottawa, Ont., and all such enquiries must be typewritten and submitted on plain paper without heading or signature and must be received on or before the twelfth day of September, 1913. They will be answered by identical communication to all competitors.

Exclusion of Designs—No competitor shall submit more than one scheme for the solution of the problem in this competition.

Any design that does not give substantially the accommodation asked for will be excluded. The submission of drawings under these conditions shall signify the acceptance of all the conditions hereinbefore and hereinafter set forth.

Drawings Required—The designs in the first competition are to be illustrated by plans, sections and elevations drawn to a scale of sixteen feet to one inch (excepting Block Plan) and must include the following plans:—

(a) Plans of each floor except where one floor is the duplicate of another floor.

(b) Three elevations.

(c) Sections on such lines as may best show the elevation of the floors of each group of buildings affected by the varying levels of the site.

(d) A detailed drawing to a scale of two feet to one inch of some portion or bay of the building as may best illustrate the general design, such detail not to exceed in length thirty or thirty-five feet on the plan.

(e) One perspective drawing not longer than thirty-six inches which must conform in all particulars with the elevations and also with the terraces, etc., as may be shown on the block plan.

(f) A block plan, to the same scale as the plan of the site enclosed with these conditions:—

This block plan to show the whole scheme as stated in clause two of these instructions.

A design would not be excluded from the competition should the authors exceed to a moderate extent the outside line of cliff either for the building or the terraces surrounding it. The extra cost of any such projection entailing as it would the building of retaining walls, etc., must be considered however as of much importance.

It should be borne in mind that some of the streets leading into Wellington Street may in the future be developed into important thoroughfares.

A space of at least three hundred feet must be maintained between the proposed buildings and the present Departmental buildings. This space can be formed into terraces, etc., as competitors may think it necessary for the proper development of their designs.

Designs—The second competition to be illustrated as before mentioned in Clause No. 15 and to consist of:—

(a) Plan of each floor except where one floor is the duplicate of another floor.

(b) Three or more elevations illustrating the principal fronts.

(c) At least three sections as required to fully illustrate the designs.

(d) Detailed drawings of one external and one internal bay to a scale of two feet to one-inch.

(e) One or two perspective drawings of the exterior. The length of such drawings not to exceed thirty-six inches. Perspective drawings must conform in all particulars with the elevations and also the position of terraces, etc., as may be shown on the block plan.

(f) A block plan as before described.

Description of Drawings—The whole of these drawings may be on paper or tracing paper (except in the case of the final designs, which must be on paper) all to be mounted on card-board and without margin. They may be in India ink or pencil. The floors to be coloured a light tint of India ink. The walls in plans and sections to be of a darker tint. A flat grey tint may be put on the door and window openings of the elevations and sections if desired. No ornamental features such as cornices, floor patterns, etc., to be shown on the plans. Pencil or light grey wash may be used at will to present work on different planes, openings, shadows and the texture of materials in the elevations and sections.

All rooms and corridors shown on the plans shall have dimensions figured thereon.

The titles of the drawings shall be in Roman capitals, all other lettering, notes and figures shall be in plain block type.

The perspective drawing or drawings may be rendered in pen and ink, in pencil or in monochrome wash and may have a margin, not over three inches in width.

The drawings shall be sent in a plain portfolio.

Report and Schedule—Each design to be accompanied by a short descriptive report, unsigned, either printed or typewritten on plain white paper of folio size, briefly describing the arrangement of the buildings and the materials to be used.

The competitor shall present a schedule giving the total area and cubic contents of each block of buildings.

The basis of the calculations for the cubic contents shall be taken from a point two feet below the finished floor of the lowest storey used for offices to a height of five feet above the level of the topmost ceiling.

The cubic contents not to include terraces or terrace walls.

Name of Author—The design together with the descriptive reports must be sent in anonymously, and the author's name and address, together with a declaration that the design has been prepared by himself and his staff in his own office with the exception of the perspective (which may be prepared outside), must be enclosed and sealed in the envelope supplied with these conditions. Form of declaration required is enclosure No. 5. The case, and each of its contents as unpacked will be marked by an officer of the Department of Public Works with a number for identification, but no distinguishing mark, motto, or device is to be put on the drawings, report, envelope or case by the competing architects or their agents.

The sealed envelopes will not be opened until after the award has been made.

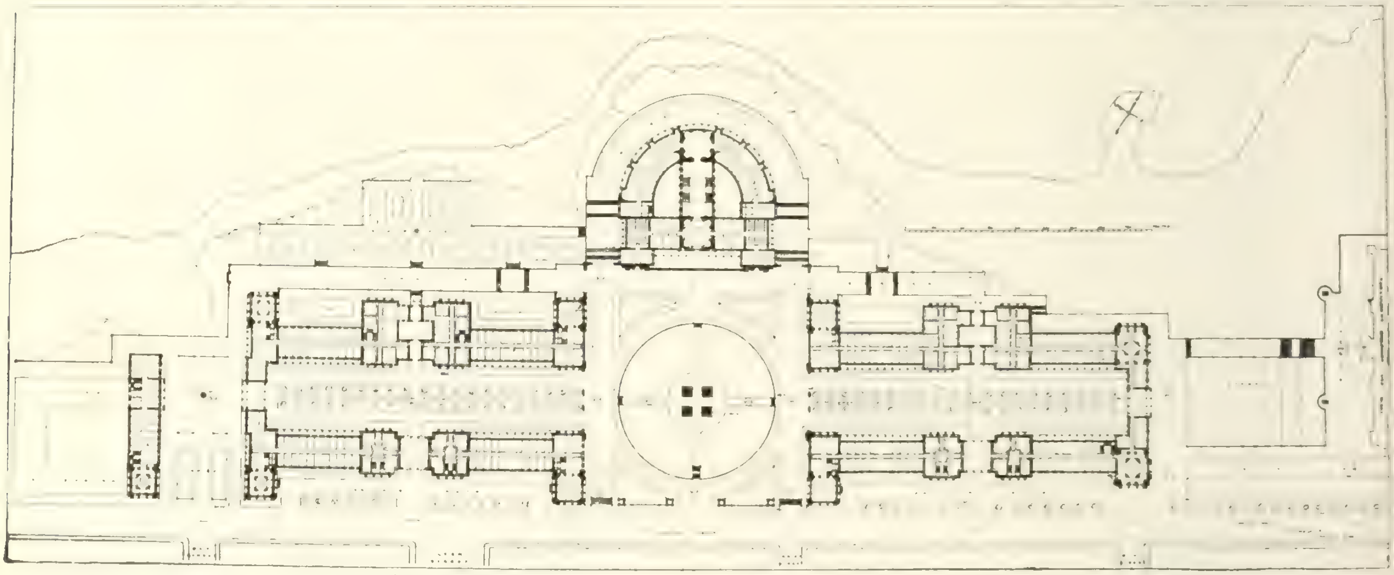
Disqualification—Any infringement of these regulations or disclosures of identity of authorship to the assessors individully or collectively or through any member of the Government shall be held sufficient ground for exclusion from the competition.

Employment of Successful Architect—The author of the design placed first by the assessors in the final competition shall be employed by the Government as architect for the work to be done at once as set forth in clause three of these conditions, provided that he can satisfy the assessors as to his possession of sufficient experience and ability to undertake and carry out the work to a successful issue. In case of his inability to so satisfy the assessors, it shall be within the power of the Government to call upon him to nominate and he shall nominate an associate architect whose professional status and experience shall be such as to satisfy the assessors and who shall be remunerated by the Government, but the amount of such remuneration shall be deducted from the commission otherwise payable to the successful architect.

Office—The successful architect must maintain an office in Ottawa during the progress of the work.

Architect to Revise Drawings—The architect, who shall be awarded the work shall, if required, make such changes in his competition plans as shall be necessary to meet the views of the Honourable the Minister of Public Works.

The Architect's Services—After the plans have been finally accepted, the architect shall prepare working drawings and specifications and shall supervise the construction of the buildings, and subject to the approval of the Honourable the Minister of Public


The suggested arrangement of the Government buildings.

Works, he shall have control of all matters of arrangement, design and execution.

Drawings and Specification—All drawings and specifications as "instruments of service" shall remain the property of the architect but one record copy on tracing linen of all contract drawings, together with a set of specifications, all amended to correspond with the work as carried out shall be furnished to and be the property of the Honourable the Minister of Public Works on the completion of the work. Whenever the Government decides to erect other buildings as set forth in section 2 of these conditions or otherwise, the Government shall have the absolute right to use such drawings and specifications in any way it thinks best.

Clerk of Works—The architect shall appoint one or more Clerk of Works, approved by the Honourable the Minister of Public Works. The architect shall regulate the duties of each Clerk of Works and shall have power to discharge him. Each Clerk of Works shall devote his whole time to the works, and shall be paid by the Government.

The Engineers and the Architect—The Honourable the Minister of Public Works shall appoint a Professional Engineer or Engineers to instal the power plant, heating, ventilating and illuminating systems. The fees for such engineering entailing advice, specifications and superintendence of the installation, shall be paid by the Government. The architect shall consult with the engineers on the general layout of their equipment and the construction of the ducts, foundations and other matters incorporated in the architect's drawing and specifications.

The architect shall receive 2½ per cent. commission on the cost of all the contracts for the aforementioned engineering work as a recompense for his services in consulting with the engineers and meeting their requirements in the arrangement of the building, as shown on his plans and described in his specification.

The Architect's Commission—The architect shall receive for his services the usual commission of 5 per cent. on the whole cost of the building proper, as distinct from the engineering work above described.

If no instructions are given him to proceed within twelve months from the date of his selection, or if the proposed works are abandoned by the Government, the selected architect shall receive payment for his services in connection with the preparation of the competition drawings (including the changes provided for in section 23 of these conditions) of a sum equal to one and one-fourth per cent. (1¼ per cent.) on the amount of the estimated expenditure. If the said architect shall be subsequently employed the one and one-fourth per cent. (1¼ per cent.) previously paid to him shall merge in his ultimate commission.

Character of Proposed Building—The style of the building is left to the discretion of the competitors.

The construction shall be fireproof throughout.

The precise materials to be employed can only be determined later. The competitors, however, shall prepare designs for buildings to be faced with Canadian stone.

The buildings generally are not to exceed five storeys in height.

Vault accommodation for storage and space for power plant need not necessarily be considered as there will be ample space in the basements.

It will not be necessary for competitors to show a basement or sub-basement plan, as this space is to be in excess of that called for in the schedule.

Total Requirements for all the Departmental Buildings to be Eventually Erected on the Proposed Site

A total floor area including all walls, corridors, lavatories, etc., of about 1,000,000 superficial feet. The arrangement of offices to be in large units for sub-division or rearrangement, as may be required.

Requirements for Courts Building

The competitors must use their discretion as to placing Court Rooms, either on the ground or firt floor.

Supreme Court

Court room	1	....	2,500
Conference room, near Court room, and to contain bookcases for Judges' Library..	1	....	800
Registrar's room	1	....	400
Registrar's stenographer adjoining registrar	1	....	300
Clerk of the Court, adjoining Registrar..	2 in all	....	800
Vault in connection with above	....	....	150
Registrar's Court (Chambers)	1	....	600
Judges's private rooms	9	400	3,600
Reporters' room	2	400	800
Sheriff	1	....	300
Secretaries to Judges	2	400	800
Waiting room, for Counsel to consult with lawyers, must be close to Court room ..	1	....	400
Barristers' and Counsel's room, wardrobes, basins, etc.	1	....	400
Messengers' room	1	....	400
Library, for the several branches and to have gallery	1	....	8,000
Clerical staff	3	400	1,200
Diningroom and kitchen	2 in all	....	500
			21,950

Exchequer Court

Court room	1	....	2,500
Judges' private rooms	3	300	900
Registrar's private office	1	....	600
Registrar's public office	1	....	1,000
Chief Clerk, adjoining Registrar	1	....	600
Vault in connection with above offices ..	..	....	200
Registrar's Court (Chambers)	1	....	600
Deputy Registrar	1	....	350
Stenographers	1	....	300
Messengers' room	1	....	500
Lunch room and kitchen	2	....	650
Waiting room	1	....	400
			8,600

Railway Commission

Court room	2,500
Commissioners offices and library	12,000
Secretary, Assistant Secretary offices and record room	10,000
Traffic Department including record room	7,000
Chief Engineer and Assistants offices	5,000
Fire Department	2,000
Chief Operating Officer Department	5,000
Law Department Offices	1,500
General offices	5,000
Total	50,000

Note.—Provision to be made in addition to above floor area for corridors, staircases, elevators, lavatories, etc.

The Montreal Harbor Commissioners have decided to construct an additional concrete elevator with a capacity of about three million bushels. Plans are now being prepared. With this elevator, the port will possess accommodation for eleven million bushels.

Micro-Organisms and Mechanical Filters

Time of Prevalence of Micro-Organisms — Effect Upon Filter—Solutions Used in Treatment—Summary

By F. H. Stover, Bacteriologist and Chemist, Louisville Water Company[1]

THE chief functions of water filters being the removal of bacteria and suspended matter the natural inference would be that the operation of the plant would be easier at the times when these substances are present in least amount. Many filter superintendents, however, find that such is not always the case and that warm weather and clear water bring troubles peculiarly their own. The usual symptoms of these troubles are marked shortening in the length of the filter runs and the prevalence about the filter beds of a pronounced odor, varying from "grassy" to "fishy" in nature. Microscopical examination of the water at such times usually reveals the presence of numerous minute forms of the type generally classified by waterworks men as "micro-organisms," which, in the waters of the Ohio River, are principally diatoms, with a few algae and miscellaneous forms present.

These organisms are usually accompanied by considerable amounts of very fine flocculent, amorphous matter, which, in part at least, is probably the result of bacterial action upon various organic substances. Since it is often present in increased amount when these micro-organisms abound, it is extremely likely that part of it is also due to the activities of these forms.

The river water at such times usually has a turbidity of less than 30 parts per million and frequently as low as 5 to 10 parts per million, while the bacterial count will vary from 300 to 3,000 at the lower turbidities. These periods of clear water are coincident with the periods of least rainfall, and the river falls to its lowest stages during these times. These conditions of clear, warm and shallow water, abundant sunlight and sluggish current afford these micro-organisms the most favorable conditions for development and their numbers increase rapidly at such times.

At Louisville the water is pumped from the river into two reservoirs having a total capacity of 100,000,000 gal., and which allow of about four days' natural sedimentation before the coagulant is added. As these are simply open basins the organisms, in some cases, increase while passing through them, but the greater depth of water, 20 ft., renders the conditions somewhat less favorable than would be encountered in the shallower parts of the river.

Of the varieties of micro-organisms found in the water about 75 per cent. are diatoms, the remainder belonging to the algae and miscellaneous groups. The forms of diatoms most commonly present are asterionella, synedra and melosira. It is only with waters of low turbidity that these troubles occur and then in marked degree apparently only when the number of organisms present exceeds 200 to 300 per cubic centimeter.

At these times the turbidity which is present consists of extremely finely divided particles and it is the opinion of Mr. Stover that each of these factors, micro-organisms, amorphous matter and fine turbidity, does its share in the shortening of the filter runs.

Low turbidities, averaging about 30 parts per million, occurred during the latter 10 days of September, 1912, at which time the water contained very few organisms and very little amorphous matter. During the first twenty days of this month filter runs averaged forty hours between washings, while for the latter third of the month, when using the water of less turbidity, they dropped to an average of 25 hours, a decrease of 38 per cent.

With these very low turbidities it becomes increasingly difficult to secure a floc of proper size and consistency, and as a result the suspended matter is able to penetrate more deeply into the sand layer than under normal conditions. In the absence of any considerable number of organisms of amorphous matter this shortening of the filter runs was attributed to the fine turbidity alone.

Early in May, 1913, a gradual shortening of the filter runs was observed and microscopical examination of the water showed only from 20 to 30 organisms per cubic centimeter. Amorphous matter, however, was present in large amount and continued so for several days, the length of the filter runs decreasing from 30 to 11 hours in a period of 9 days, although the number of organisms present during this time never exceeded 200 per cubic centimeter and remained during most of the period considerably below this figure. An instance of the combined effects of all three factors was observed between the dates of May 9 and 24.

General Effects Upon Filters

The first sign of approaching trouble is usually noticed after using for several days a water having a turbidity of about 30 parts per million or less when a progressive decrease in the length of the runs commences. Filters which have been making 30-hour runs without reaching over 4 or 5 ft. loss of head will drop to 25 or 20 hours inside of a couple of days and will reach a maximum loss of head of 8 ft. in this time. In other cases successive runs will show a decrease of 25 to 50 per cent., especially as the runs drop below 25 hours, when the decrease has sometimes been so rapid that at the end of a few days the best runs would average only 2 to 3 hours in length.

At such times the surface of the sand in the filters seems to become abnormally hard and compact in a short time, and when broken up the sand grains show a slight tendency to stick together. This condition cannot be wholly corrected even by thorough washing.

Microscopic examination of the sand when in this condition usually reveals the presence of numerous diatoms and other organisms, apparently cemented together in a matrix of amorphous matter and fine turbidity. These living organisms, it is believed, accelerate the formation and retention of this gelatinous film on the sand grains. In support of this may be mentioned the following: During the period from May 19 to June 14, 1911, the number of micro-organisms in practically all the samples examined was about 600 per cubic centimeter, the variations from this number, except in one instance, being so slight that it may be said to have remained practically constant. Yet during this period the length of the filter runs steadily decreased, until application of copper sulphate was made on May 26, following which there was a general increase in the length of the runs for a period of 6 days.

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[1] From a paper before the American Water Works Association, Minneapolis.

The only observable difference in the water coming to the filters during this period was that it contained dead instead of living organisms. The amount of turbidity and amorphous matter and the number of organisms were practically unchanged, the shortening of the runs having been apparently due to the cumulative effects of a constant number of organisms.

A similar increase in the length of the runs has also been observed when the organisms in the water died, apparently from natural causes. The rise between June 6 and 8 is attributed to this cause, for at this time the effect of the copper sulphite treatment of May 26 was at an end and the higher turbidity of June 10 and 11 had not yet arrived. During the times that the turbidity curve remains approximately constant the increases and decreases in the length of the filter runs follow quite closely the variations in the number of micro-organisms present.

The decreases in the length of the filter runs of course cause correspondingly large increases in the amounts of wash water used. During the year 1912 the average amount of wash water used at Louisville was 2.05 per cent.—the lowest average for any one month being 1.44 per cent. During the periods of shortened filter runs, however, the amounts will vary from 6 to 10.7 per cent.

Methods of Treatment

The methods of treatment tested have been of three kinds—killing by chemicals; attempted removal by increased coagulation, and obtaining a different character of water, as in by-passing the sedimentation basins and drawing direct from the river.

The use of hypochlorite of lime for this purpose had been considered early in 1911, but before an opportunity offered for a trial of it some results of its use in this way were published by Mr. J. W. Ellms, of Cincinnati, in the spring of 1911. His experiments were attended by some success, but the results were not all that could be desired. One of his conclusions was that the nearer the hypo was applied to the filter beds the better the results in increasing the length of the filter runs, and that hypo applied directly to the filter beds gave the best results of all.

Not being equipped with devices for applying hypo accurately as a continuously fed solution, it was decided to apply it as a powder to one of the filter beds. This was done by draining off the filter until about 3 inches of water remained on it and scattering the powder uniformly over the surface, after which the bed was allowed to stand for a period of 24 hours. It was then washed and put into servcie.

No improvement in the length of the runs followed this treatment, and the bacterial efficiency of the bed for several days following was much below normal. The amount of hypo used was 12 lb. on a filter 30 x 72 ft. in size. No further experiments were made with the hypo.

Use of Copper Sulphate

With the copper sulphate applications markedly favorable results have been secured in all but one instance, and even in this case the results cannot be said to have been negative, as the runs were kept at 6 hours and above under conditions when much lower ones might have been expected, and probably would have been expected, and probably would have occurred had not the copper been used. The minimum length of runs reached at this time was 5 hours, which occurred 9 days after this dosing.

Within 24 hours after the application of the copper there was in each instance a noticeable increase in the length of the filter runs and that these lengthened runs continued for periods varying from 8 to 19 days in length.

The copper was applied in the second sedimentation basin and in the coagulant basin by dragging bags of it from a boat. It is probable, however, that equally good results could be obtained by applying it as a solution, in a manner similar to that by which alum or hypo are applied.

In plants not provided with sedimentation basins, but which run the incoming water direct to coagulant basins, at least 12 hours should be allowed between the application of the copper and the filtering of the water and a slightly longer period would be desirable if possible.

Usually the length of the filter runs would begin to increase in from 12 to 24 hours after the application of the copper. Hence in figuring the cost per million gallons filtered the cost was apportioned over the amount of water filtered during the period of increased runs following the application of the chemical.

A careful examination of the water from the basins, both as it flowed to the filters after coagulation and again after filtration, failed to reveal the presence of even a trace of copper. There were numerous fish in the reservoir, but except in the cases of a few very small and apparently newly hatched ones, practically none was killed. During and for a few hours subsequent to the application of the copper a few large fish were observed to come to the surface for a short time, acting slightly dazed, but it was apparently a temporary effect only.

The only drawback to the application of the copper is that a large increase of bacteria has been observed to follow its use, but this may be in some measure due to local conditions and need not necessarily be met with in other waters.

The explanation of this bacterial increase is probably that the killing of the micro-organisms and possibly some of the less resistant bacteria leaves some of the hardier forms in the midst of an abundant food supply and freed for the moment from any antagonistic effects of other forms. Hence a rapid increase follows for a short period. No B. coli were detected during this time, however, and it was found that the application of 0.25 part per million of available chlorine was sufficient to eliminate this increase, so that in plants provided with a sterilization plant this increase can be readily taken care of if it occurs.

The removal of the micro-organisms by increasing the dose of coagulant beyond that necessary for bacterial efficiency was tried but did not give results of a promising nature. Doubling the normal dose of coagulant increased the removal of the organisms by only 10 per cent. and had very little effect on the runs.

The use of river water direct to coagulant basins was tried in two instances, and in both cases gave encouraging results, although in each case an increase in turbidity followed within a few days and thus left no opportunity to see how long this improvement would have lasted.

In addition to the regular determinations of micro-organisms and amorphous matter, the determination of the actual time of filtration of a given volume of the water under investigation has been found of value. This has been done by using what may be termed a miniature filter. In order to expedite matters the Sedgwick-Rafter filter, which is commonly employed to concentrate micro-organisms before counting, was used, and thus all the determinations were made by the use of one sample.

In the river sample of June 21, 1912, it was observed that the time of filtration of the 500 cubic cm. through the Sedgwick-Rafter filter was only one hour as compared to about three hours for the water, which was coming from the sedimentation basins. The river sample contained about the same number of organisms, but much less amorphous matter than the sedimented sample.

The sedimentation basins were therefore by-passed and the river water run direct to the coagulant basins. An immediate increase in the length of the runs followed; the increase was from 5 to 9 hours in the following three days. A rise in turbidity occurring at this time put the runs back to normal.

The samples on which the time of filtration was noted were simply poured onto the small filter just as for an ordinary examination for micro-organisms, care being taken to use exactly the same amounts of sand and water in each instance. When the turbidity of the water exceeds 50 parts per million these small filters clog rapidly and this determination becomes of no value. This test has one advantage, however, in that it can be made by a person not familiar with micro-organism work and it does not require the use of a microscope.

Summary

The water of the Ohio River, when of a turbidity below 30 parts per million, almost invariably causes decreases in the length of the filter runs. If such turbidities are accompanied by micro-organism and much amorphous matter, still greater decreases follow. Filter runs may be greatly increased by the judicious use of copper sulphate, although after-growths of bacteria sometimes follow its application and must be guarded against. Small doses of hypochlorite of lime do not affect these micro-organisms in such a way as to increase the length of the filter runs. The determination of the time of filtration of samples of water through small laboratory filters will in some instances enable the operator to select the water from that point of his system which will give the longest filter runs.

Methods of Distributing Overhead Expenses

By Royal R. Keely

ALL expenditure in any industry may be divided into three broad classes, labor, material, expense; or, more broadly, into direct and indirect expense. Direct expense may be defined as all that may be charged directly to the product; indirect expense as all other expense connected with the conduct of the business and which must be borne by the sale of the product.

In a foundry, for example, the labor applied directly in producing a length of cast-iron water pipe is called direct labor expense; that is, it is the labor applied directly to the product of this piece of pipe and is in no way related to other articles that may be produced. The pig iron required in making the length of pipe is direct stores expense. Other labor connected with the administration or supervision is classed as indirect expense. Stores required for repair of building and equipment, office supplies, etc., are classed as indirect stores expense.

In order that the management may intelligently conduct any business, the cost of each article of product should be known. In determining the cost of the length of cast-iron pipe referred to, the labor applied directly in making it, as for instance, the setting up of the mold, pouring of the metal, removing of the form from the mold and cleaning it of sand, etc., and the pig iron entering into it, may be charged directly to its cost. But since all expense of the conduct of the business must be borne by the product, this individual length of pipe must bear its share of the expense of supervision, taxes, insurance, depreciation, repairs, heat, light and power, selling and advertising, general office expense, etc.

Methods of Determination

The determination of just what its share of these expenses should be has aroused much controversy, and there are in use to-day six methods of determining this indirect or overhead expense: (a) in proportion to material used; (b) in proportion to the direct labor charge; (c) the time or number of man-hours employed in production; (d) machine rates; (e) cost numbers or factors; (f) prorating by inspection or judgment.

The first of these may be satisfactory if the product is homogeneous, as brick from a brickyard, where if any one kind of brick constitutes one-tenth the product of the plant, this will take one-tenth of the total overhead expense.

The second, that of apportioning expense according to wages paid, is very generally used. Here, if the direct wages paid on any kind of cast-iron pipe are one-tenth the total direct wages for the foundry, then this kind of pipe bears one-tenth of the total overhead expense. The objection to the method is that a job produced by a 40-cent man at a vise and bench would bear the same proportion of overhead expense as one produced by the same man on a large and very expensive machine. This method will be sufficiently accurate only in cases where the workplaces are all of nearly equal value and capacity and the workmen paid fairly uniform wages.

By the third method overhead expense is apportioned by the time spent on the job, instead of the value of the time, as in (b). It also does not take account of the equipment.

In the machine hour, or the workplace hour method, the rate is figured to include all expense of maintaining and operating the given workplace, a term broad enough to include everything, from an allotted area where a man may work with a monkey wrench or paint brush to the most complicated and costly machine in the shop.

Machine Rates

In a modern office building the income-bearing unit is the office room to be rented, and in fixing the rental account must be taken of all the overhead expense. In a machine shop, each workplace may be regarded as enclosed by four imaginary walls, forming a room of suitable size for the performance of its operation. Each workplace is then considered as a unit in itself from which profit may be made in turning out a product, or it may be rented to an individual workman.

If all the workplaces are rented, then the source of income is not on product sold, but altogether from rental on the available useful space of the manufacturing plant. All space, however, cannot be turned into rentable workplaces, for there must be general heat, light and power plant, storage space, aisles, halls, passages, offices, etc. The rented space, therefore, must not only maintain and operate the entire shop, but must produce a profit for the owners. Each workplace unit must bear its share of interest and depreciation on its building, interest and depreciation on the cost of machine, taxes, insurance, etc., on the investment, repairs and maintenance of building and equipment, its share of heat, light, power, etc., as well as all other general charges, if it is to make a profit for its owners.

The cost of the product from each workplace is made up of rental, raw material entering into the product, and a fair compensation for the worker, and the selling price must include his profits. The rental of each workplace must be a figure that will enable its operator to make a profit and must at the same time pay all the owner's expenses and make a profit besides. Provision must also be made for the idle time of a workplace.

This indicates the method of arriving at the machine rate. The method is superior to the others in that it takes account of the variation in the cost of production on different types of workplaces, and would be accurate if there were no idle hours. In any system the wages are very carefully charged directly to the item of product, but since the general charges of interest, depreciation, insurance, etc., may be equal to or greater than the wages, it is important to cut these down to a minimum by putting as great a proportion as possible directly against the particular items of product, as in this method.

Mr. Church in his book on Expense Burden advocates a supplementary rate to dispose of the expense connected with the idle hours and the auxiliary departments, as shipping room, store room, etc. By this plan, expenditure is connected with production centers, the charges being debited to jobs by machine rents or rates so carefully arranged as to include all of them. All floating or general items are collected into a monthly shop-charges account, which is relieved by the total of charges which have been debited during the month by means of machine rates, leaving in the account a residual sum. This sum is reduced by the supplementary rate to an hourly burden, distributed over the jobs in the usual way.

To quote from Mr. Church himself: "It will be obvious that by this means all the charges will be distributed, leaving nothing in the charges account, and that if all the machines have made full time in the month, the supplementary rate will rise, because only working hours are credited to the shop account as per the total of the machine rates found at the end of the month. Thus we secure that each job gets its own expenses only attached to it, plus an average of floating charge and of what surplus may be due to slack times or inefficiency in the shop."

Again he says: "The idleness of a machine may or may not be considered as the fault of that machine. If, for instance, a machine was found to be idle nineteen-twentieths of its time, this might be due to one of two causes. Either the process was rare but essential, or the machine itself was largely superfluous. In the first case it would be eminently fair that the charge should be made very high when it was put in use, since the shop charges due to its presence and upkeep are indubitably incurred for the sake of this occasional use In the second case it might be rather a matter of accommodation that the machine was retained at all, in which case the shop as a whole should bear the burden and not the unlucky piece of work that should happen to be put on such machine at that time." It is thus seen how this ingenious method puts to each item of product its proper share of overhead charges, for the workplaces which are in use. Then the balance left over, due to idle machines and other auxiliary and general expense, is prorated by a supplementary rate.

Cost Numbers

In the fifth method, that of cost numbers or factors, which is a simpler system worked out by Frederick W. Taylor in his study of Scientific Management, the machine rates are determined by a process similar to that already described, and the rates are then treated not as figures of value, but as relative numbers called "relative cost numbers," or simply "cost numbers." If the cost of maintaining and operating two machines is three cents and three dollars per hour respectively, the cost numbers will be three and three hundred respectively. The number of hours each machine runs on any job is multiplied by its cost number. At the end of the period, the total hours by cost numbers for each article or class of product on which it is desired to compute costs and also for the entire shop, are added together. The result obtained is about the same as that reached by Mr. Church's method, without the complication and extra work of apportioning a second time for the supplementary rate.

In general, a rate for apportioning the overhead expense can be established by this method for any class of product and the variation of the rate from period to period will give an accurate indication of the percentage of idle time in connection with this product. The disposal of all shop expense is now provided for. There will be few difficulties in the way of putting the direct labor and stores charge against the article of product into which it enters.

The writer generally accomplishes this result by assigning to the product and stores a definite, concise symbol for each size and kind. The mnemonic system of symbolization, as developed by Mr. Taylor, gives most excellent results. All expense in connection with the conduct of a business is divided, into (a) auxiliary, or "A" accounts, as power, stores, shipping, planning, etc.; (b) business office, or "B" accounts; (c) sales department, or "C" accounts; (d) manufacturing departments, or "D" accounts; (e) machinery and equipment, or "Y" accounts; (f) real estate, or 'Z'" accounts.

The expenses in connection with the A, D, Y and Z accounts are shop expenses and are disposed of by the method of hours by cost numbers, already described. B and C have no direct relation to shop costs and the expense of these departments may be disposed of by another method to be considered presently. All labor is apportioned by a system of job cards, time-stamped at the beginning and again at the end of the job. The sum of the time shown on all these cards must equal the time for which the workman is paid. There is only one job on a card and each card bears the symbol of the product to which the time is charged. The stores are issued from the store room on similar cards. During the period all job cards and stores issue cards are accumulated by symbol in a card index file. At the end of the period the total of all money paid, as represented by the cards, is drawn off by products.

In the classification of expense there is a symbol for each item of expense, both direct and indirect. The direct labor and stores can now be entered at once on the cost card for product turned out. The indirect labor and stores are entered on expense distribution cards, together with other indirect charges, as taxes, insurance, depreciation, etc.

The selling and business office expense, B and C, may be apportioned by a different method, either by direct shop cost, by wages, or by the time consumed in the manufacture of the product, according to the nature of the business. In some cases it may be merged with the shop expense and the total prorated by the method outlined. The usual method is by direct labor cost, or by hours of labor consumed in production.

Inspection or Judgment

The sixth method of apportioning the overhead expense, i.e., by inspection or judgment, is one in which the experience and judgment of officials of a company are used in putting this expense where it belongs.

To arrive at a practical method for doing this, the principal items of expense, which may include advertising, catalogs, correspondence, legal expense, patents, traveling expense, salesmen's salaries, drawings, etc., are listed and the expense of each apportioned to each class of product in proportion to the benefit derived, the proportion being determined from inspection. Thus, it may appear that advertising expense should be distributed among four different products as follows: 10 per cent to the product A, 20 per cent to the product B, 30 per cent. to the product C, and 40 per cent. to the product D. Product A may be an old and staple article, having a general demand, while D may be a new and patented article for which demand must be created by advertising.

If the profit on any class of product is exceptionally high or low, it will call for a careful examination of the direct and prorated charges. The direct charges of stores and labor are very definite items and on these there can be little question. The indirect charges, especially those in connection with business administration and selling, are very intangible and hard to connect with any expense of manufacture, but it must be remembered that every dollar or expense, both direct and indirect, must be borne by the product which is made and sold.

The method of Hours by Cost Numbers for all shop expense and that of apportioning by inspection for selling and business administration expense, are most generally applicable to the ordinary manufacturing establishment.

Other Methods of Prorating Overhead Expense

A seventh method of prorating overhead expense consists in a combination of (a) and (b), prorating the expense in proportion to the sum of the material and labor costs.

For example, suppose that in a given time there are two products made, A and B, the first costing $100 for material and $50 for labor, the second $50 for material and $100 for labor, the overhead charges, or burden, for the two together being $150. By the two methods of prorating given by Mr. Keely, (a) in proportion to the material, and (b) in proportion to labor, the cost accounts would show the following:

By method (a)	A	B
Material	$100	$ 50
Labor	50	100
Burden	100	50
Total factory cost	$250	$200
By method (b)		
Material	$100	$ 50
Labor	50	100
Burden	50	100
	$200	$250
By the combined method we would have		
Material	$100	$ 50
Labor	50	100
Burden	75	75
	$225	$225

Still another modification would be to charge material and credit burden with a certain percentage of the material cost, to cover storage and interest on capital invested in the material, and to apportion the remainder of the burden in proportion to the sum of the labor and of the material cost thus enhanced; thus, if 20 per cent. is added to the cost of material, the account would stand.

	A	B
Material	$100	$ 50
Add 20 per cent.	20	10
Labor	50	100
Sum	$170	$160
Remainder of burden prorated	62	58
	$232	$218

Whether any of these methods, or the machine hour, or cost number method should be adopted in any particular plant depends on the nature of the business, and on the object that is to be obtained by the cost system.

Regarding the length of cast-iron pipe, assuming that it is only one of a hundred kinds of castings that the foundry makes, it is impossible to apportion precisely its share of the expense of supervision, taxes, insurance, depreciation, light, power, etc. Suppose the piece of pipe is not a regular product of the foundry, but only an occasional one ordered by a neighboring shop, the order being accepted at a very low price because the foundry is short of orders at the time. The bookkeeper reports that money has been lost on that pipe, and presents the following account: Material, including waste, 1 cent per lb.; labor 0.5 cent; burden 1 cent; total 2.5 cents per lb. Sold for 2 cents; loss 0.5 cent. The owner says, "I think we have made money on that order, for the cost of labor and material was 1.5 cents, and the selling price 2 cents, leaves a margin of 0.5 cent to apply to burden. It cost nothing for selling and advertising, and the expense for supervision, taxes, etc., would have gone on if we had not taken the order." Six months later the order is repeated, when the foundry is full of profitable orders, and the price is made 3 cents, not because the cost including burden is 2.5 cents and 0.5 cent is wanted for profit, but because that is "the price the market will bear."

The following is a system of making an estimate of a machine-hour cost. Assume a large and expensive machine costing $2,000, which is in use a different number of days each month. The cost-clerk may present the following tabulation of annual burden charges to be made against it:

	Cost while Idle	Additional Cost while Running
Interest, 5 per cent. on $2,000	$100	
Rent, 100 sq. ft. at 50 cents	50	
Taxes, 2 per cent. on half value	20	
Insurance, 0.5 per cent. on value	10	
Light and heat (in winter only)	20	
Depreciation (obsolescence and corrosion), 5 per cent.	100	
Repairs or depreciation due to wear, 2 per cent.		$40
Lubrication and cleaning, say		10
Power, 2 h.p., estimated load factor, 0.25; 2 × 3,000 hours × 0.25 × 2 cents per h.p. hr		30
Superintendence, office expense, etc. Total $20,000, share of this machine, 0.5 per cent.		100
	$300	$180
	180	
Total	$480	
Add for contingencies 25 per cent.	120	
	$600 or $50 per month	

Charge $50 per month
$2 per day if running 25 days per month
5 per day if running 10 days per month
10 per day if running 5 days per month

Labor costs $3 per day for each day the machine runs

Days run in a month	5	10	25
Labor cost at $3	$15	30	75
Machine hour cost	$50	50	50
Total	$65	80	125
Number of units of product made	50	100	250
Cost per unit	$1.30	0.80	0.50

Supose these units are sold so as to net the factory 80 cents each

Loss, each	0.50	0	——
Profit	——	——	0.30

Or suppose these units are parts of a finished product, shall they be billed to that product, 50 units at $1.30, 100 at 80 cents, 250 at 50 cents, plus the charge for material (whatever it may be), making it appear that the cost of the product varies from month to month according to the number of idle days of a certain machine during a preceding month?

A far better way is to have a fixed hourly charge for the machine in question, which is not changed during a whole year. For example, it may be estimated that the machine will be in use 150 days in the year, averaging 12½ days per month. The daily charge then will be 50 ÷ 12½ = $4.00, and if the work day is 10 hours, 40 cents per hour. The cost of these units will then appear as follows:

Days run in a month	5	10	25
Labor cost at $3	$15	30	75
Burden at $4	20	40	100
Total	$35	70	175
Number of units made	50	100	250
Cost per unit	$0.70	0.70	0.70

This plan not only saves the bookkeeper's time in figuring the hourly cost each month, but makes a fairer charge to the finished product of which these units are part, which product should not be charged with the accidental idleness of any one machine.

We can get the percentage of idle time directly for each machine by summing up from the time cards the number of hours credited to it in each year, or month if need be. Assuming that the machine should run 12½ days on an average to earn $50 per month, the table last given shows that we lost $30 on it the first month, $10 the second, and gained $50 the third.

I wish especially to emphasize the inadvisability of charging to a machine hour any part of the selling expenses, advertising, etc. The machine hour is part of the factory expense, and should not be charged with losses due to inefficient salesmanship. The sales department should be considered as a separate business from the factory, and should have a separate system of accounts.

Extensive Transit Undertaking

RAPID transit for every section of the city by the year 1918, at a cost of approximately sixty millions of dollars is recommended in the report of the Director of Transit for the city of Philadelphia. In the system all three methods of urban transportation are to be used. The present surface lines will be extended and subways, in some cases containing four tracks, will be employed largely in the business centre, while in the less densely peopled part, elevated roads will be put in commission. Of the total cost the city is to provide some thirty-five millions of dollars, while the Rapid Transit Company will supply twenty-three millions. Until 1918 the municipal coffers will not receive one cent for the outlay, and after that the returns will not be sufficient to pay the interest on the sinking funds. However, this loss will be more than compensated for by the increased taxation through the extension of the city's limits made possible by the improved transportation facilities.

Some experiments with the Goldschmidt system of wireless telegraphy have recently been carried out in Germany. Stations have been erected by this company at Eilverse, near Hanover, and at Tuckerton, in the United States, the distance between the two stations being over 4,000 miles. It is stated that the messages transmitted from Eilverse were received with perfect distinctness at Tuckerton. The results are considered to be all the more successful as the American station is not yet quite completed, and the antennae have at present a height of only 400 ft. Moreover, the experiments took place in daylight.

Some particulars are now available of the important trial of oil-burning locomotives which is about to be carried out on the North-Western State Railway of India. There will be a six months' preliminary trial for the purpose of testing different types of burners, followed by a twelve months' trial to determine the relative values of oil and coal. Six heavy passenger engines are to be equipped with oil-burning apparatus for the latter trial and work against six coal-burning engines. Three engines of each kind will work the mail trains and three of each type the passenger trains between Karachi and Padidan.

Building in the Maritime Provinces

Correspondence of the Contract Record

Throughout the summer work has been in progress on the breakwater at Courtenay Bay, N.B., and upon the site of the dry dock, the C. P. R. elevator at west St. John, the site of the new post office building, the new sugar refinery, the new marine depot, two new bank buildings, a large new warehouse, street railway extension and enlargement of plant, the new Keith's Theatre, the foundation of the new highway and street car bridge between East and West St. John, and many new buildings are being erected in the city and its outskirts. On some of these contracts work has proceeded day and night, so that the demand for labor has been much greater than for many years past. Norton Griffiths & Company, of England, the Metcalf Construction Company and the Foundation Company, a Philadelphia firm of builders, several dredging companies, Rhodes Curry & Company, and a number of other large construction companies are carrying out contracts at St. John this year.

Building permits issued in St. John during July showed an increase of three times the value of those issued in July last year, while the value of permits issued for the year ending July 31st, was nearly four times as great as for the preceding year. This relates only to building within the city limits. The amount of building in the outskirts has shown an even greater increase.

The St. John Railway Company will shortly complete the extension of its line toward East St. John, and is adding to its plant. Five new cars have just been added. It is expected that within a year the company will be able to give a continuous service over the new bridge between East and West St. John.

The branch railway from Fredericton to Minto in the Queens County coal fields has been so nearly completed that it is possible for coal trains to pass over the line. The completion of this branch line brings the mines into connection with the Canadian Pacific Railway system, and a larger market than was before available. The Canadian Pacific will operate the line and also its extension from Minto through to a junction with the Intercolonial Railway at Norton, and it is spending a good deal of money this year putting the Norton branch in better condition for traffic.

Two bridges which involve serious engineering problems are receiving the attention of engineers in connection with the St. John Valley Railway, or that portion of it between Gagetown in Queens County and the city of St. John. When this railway is completed, and the Grand Trunk Pacific Railway is also completed, the latter will send freight which is routed for St. John over the Valley Railway from a point near Fredericton. Hence, the Valley Railway must be up to the standard of a transcontinental line. Between Gagetown and St. John the railway must cross the St. John River and Kennebeccasis River, at points where both are very wide and where it will be extremely difficult to get foundation piers. Plans were prepared, but were not satisfactory, and new plans and estimates are now in preparation. The federal parliament has voted a million dollars for the construction of these two bridges, but doubt is expressed whether this amount will be sufficient. The original contract provided that this railway was to be completed by November, 1915, but it is regarded as impossible to complete these bridges in that time, since the plans have not yet been completed nor anything done in preparation for the work of construction.

Another important bridge contract in New Brunswick is that at St. John, where a street railway and general traffic bridge is to be erected to connect East and West St. John. It is to be completed within a year. Work on the foundation has been in progress for some time, and orders have been placed for the material of the superstructure. It will be the longest spandrel-arch bridge in the world. Still another important bridge contract is that at Newcastle, where a traffic bridge is being erected across the Miramichi River, which is of great width at that place. A company has also been formed to build an international bridge across the St. John River at St. Leonards, to connect the New Brunswick and Maine railway systems, but arrangements have not yet been completed for going on with this work.

The financial stringency has had no effect upon the heavy construction work in progress in St. John. A great amount of dredging is being done in the harbor, new wharves of timber and concrete are being erected, the million bushel elevator for the C. P. R. will be completed this year, dredging and wharf building for a marine depot for government vessels are in progress, the great breakwater in Courtney Bay has been thrust out to a length of three thousand feet and is still being extended, the foundations for four of the great buildings for the sugar refinery have been sunk, and work has been begun on the steel superstructure, while work on the foundation of the other three buildings of the group is proceeding. The foundation for the new post office has been excavated out of solid rock, and a similar task has just been completed on the site of a new building for the Bank of British North America, while many other works of minor importance, but requiring engineering skill, are in progress. The city is doing a considerable amount of street paving this year, and extending the water and sewerage system, as well as renewing a good deal of the water distribution system. Half a dozen contracting companies, at least four of them of international experience, have contracts for construction work at St. John this summer. The conditions under which construction work is carried on vary a great deal. For example, to get a foundation for the sugar refinery, it was necessary to sink a large number of concrete piers from twenty to more than thirty feet, and thus the result of many months of work carried on by a large crew of men, working night and day, is hidden below ground. On the other hand, at the site of the post office it was necessary to keep drilling machines constantly at work, and to blast out a difficult kind of rock, and here, too, a large crew of men have been at work for many months, and have not yet completed the very large excavation necessary under the contract for the massive structure to be erected. At the site of the grain elevator, which is now nearing completion, it was necessary to sink piers to a great depth to a footing on ledges of rock, but it was also necessary to reckon with the tide, which flowed in and made it impossible to work continuously on the job. The men were only able to work between tides, and thus the hours of work were constantly being changed.

One of the department stores of Madras, India, has put into use two up-to-date motor delivery vans. This method of delivery has proved so satisfactory in that widespread city, that other business houses will probably speedily adopt it.

New Church at Westmount, P.Q.

The Westmount Methodist Church, P.Q., is to be erected from designs by Badgley and Nichlas, architects, Cleveland Ohio. It is in a modified type of English Gothic architecture, and will be built on a site 85 x 132, at the corner of Sherbrooke Street and Roslyn Avenue. The exterior is to be of Credit Valley stone, the interior being finished in oak. The church and Sunday School adjoin on the same floor level, separated by a lifting partition, so that they may be opened togther when required. The partition is mechanically operated and finished and frescoed to match the walls. This plan gives a combination of the two departments without marring the churchly character of the building. A gallery is situated on each side, and when the partition is raised, the gallery is continued round three sides of the church. The church will have seating accommodation for 1200 people and the Sunday School for 600.

The Sunday School consists of a main room surrounded by two tiers of class rooms, arranged to open together by folding doors, so that the entire school can be gathered together for the opening and closing services. The basement will be high and well lighted and fitted up to accommodate the social life of the church. It will contain a large dining hall, also used for gymnasium and entertainment hall, ladies' parlour, boys' and girls' showers and locker rooms, kitchen, store rooms, boiler and coal rooms and toilet rooms.

The plans show three entrances, from Sherbrooke street and Roslyn Avenue, the latter being the principal one. From two of the entrances access is given by the vestibules to both the church and the Sunday school.

Methodist Church, Westmount.

The heating will be by steam with a very complete arrangement of automatic ventilation, while the lighting will be indirect electric fixtures.

A rather unique method of repairing a concrete wall surface damaged by freezing before setting, was successfully used in the case of a retaining wall on the Pennsylvania Railroad at South Fork, Pa. The patch has now stood over 15 months, and is apparently in as good condition as when placed. The faulty concrete was removed by a small hand pick to depths varying from 1 to 18 inches. The sound concrete exposed was carefully cleaned; steel dowels were driven into it at 6-inch intervals, and a light reinforcing mesh attached to the dowels. Forms were then placed for the face of the wall, the concrete thoroughly wetted, and the holes filled with a 1.2 mortar.

Office Building for Port Arthur

The concrete frame work of the new Whalen office building at the corner of Cumberland and VanNorman streets, Port Arthur, is nearing completion. Six storeys are completed and two yet remain to be added. When completed the building will accommodate 180 offices on its eight floors. Outside the structure will be completed in white terra cotta on the three sides facing the streets and the base will be of granite.

Whalen Building, Port Arthur.

The finish and equipment will be thoroughly modern and up-to-date. Maple floors are to be provided and marble corridors. Mahogany trim will be used, while the doors will be inlaid with mahogany. A vacuum cleaning system is to be installed and the building will be heated by steam. Three high speed elevators will provide accommodation for the office tenants.

The building, which will be fireproof throughout, will cost in the neighborhood of $450,000. The Canadian Stewart Contracting Company, who are in charge of the work, have employed on an average of 100 men daily since the work began. This is the first office building to be erected in the Twin Cities and it is to be completed and equipped in a way that would do credit to any city on the continent. The foundations were constructed with a view to a possible addition of three storeys later, making a total of eleven storeys.

The Clyde navigation trustees, it is stated, do not intend to apply to parliament for the necessary authority for carrying out the whole of the new dock extension scheme of which they have just approved, but are only going to proceed with the construction of three of the five basins authorized to be built. These basins, which will be in the centre of the new dock system, will be large enough to accommodate four of the largest Clyde-North Atlantic liners of to-day, and as soon as the necessary powers are obtained the work of construction will begin.

The Ozonair System of Pure Air Ventilation

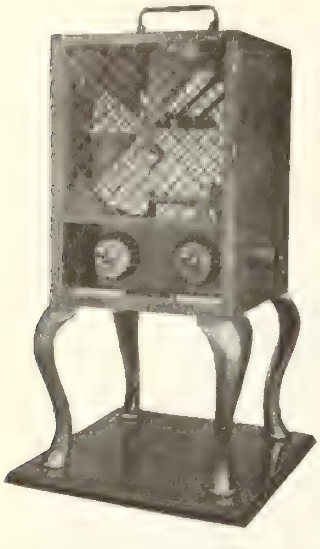


Fig. 1—The Portable Type for Offices and Living Rooms.

SINCE the successful installation of an Ozonair Air Purifying plant as an addition to the existing ventilating system in the House of Commons, Ottawa, the advantages of using ozone for ventilation and air purification have been largely discussed. In this article therefore, we propose to give a brief description of the Ozonair System of Pure Air Ventilation.

What Ozone is.—Ozone is a gas, and is known as an allotropic form of oxygen. It has an odour somewhat resembling seaweed and a light blue colour, whereas oxygen is both odourless and colourless. A molecule of oxygen consists of two atoms—that is to say, oxygen atoms always go about in couples. Ozone on the other hand, has a molecule comprising three atoms of oxygen, but it has only a short life of about 40 minutes, after which time it reverts to oxygen, not because two is company and three is not, but because the molecule is very unstable and the extra atom is desirous of attacking something in order to oxidise it. Hence ozone is the most powerful oxidising agent known and this is the secret of its utility. The chemical formula for oxygen is O_2, for ozone, O_3.

How Ozone is Made.—Ozone can be formed chemically, but not on a commercial scale, so this need not be dealt with, but means have been discovered in recent years of producing pure ozone on a commercial scale by silent electrical discharges in the form of a condenser action. Since then the industrial and other applications have followed. It must be mentioned however, that ozone is formed whenever oxygen is subjected to an electrical spark; but in these cases harmful gases are formed at the same time, which are as harmful as ozone, in suitable concentrations, is beneficial.

Ozone Applied to Ventilation.—This application is more properly known as "Air Purification," because ozone, when used at a concentration suitable for breathing, will destroy all organic particles in the air due to exhalations from the lungs, body, clothes, or to cooking smells and other causes of pollution met with in human habitations or places where people congregate. It will also clear the air of tobacco smoke and is therefore of additional value in restaurants and cafes and places of amusement where smoking is allowed.

Besides removing these impurities, it renders the air fresh and exhilarating, and also partially sterilizes it—that is, the weaker bacteria are destroyed. When used for these purposes the concentration of ozone is about one part of ozone to a million parts of air by volume, and if the smell of ozone is too noticeable, this is a sign that the ozone has done its work and is present in excess. A commercial ozone apparatus should therefore be capable of being switched off or regulated.

There are three ways of applying ozone to ventilation. These are (1) by the use of portable ozonisers with self-contained fans, where there are suitable inlets for fresh air to be ozonized, as in rooms, offices, shops, warehouses, works, hospitals and even some theatres, in fact, in all places where the number of persons is not so great as to consume all the oxygen in the air that can find its way in. Fig. 1 shows a small portable ozonizer. (2) Where there is an existing system of ventilation by the introduction of fresh air under pressure, by inserting a suitable ozoniser in the main air duct. (3) By the installation of a complete system of ventilation by means of ozonized fresh air, with fans, ozonizers, duct work, etc., with suitable openings for its distribution in the building. Fig. 2 shows a diagramatic arrangement of a complete ozonair ventilating system. It will be seen here that the air is drawn from the freshest source and washed through a screen where all the impurities and deleterious gases are removed, then into the mixing chamber and on into the ducts. The ozone is drawn into the mixing chamber through a small pipe and is here mixed to a suitable concentration with the cleaned air.

It may be mentioned that where a complete ozonair ventilating plant is installed, it is found that only one-third the amount of air is necessary compared with an ordinary system of ventilation by means of non-ozonized air, in order to produce equal results without draughts. The system is extremely simple and the running costs are understood to be practically negligible.

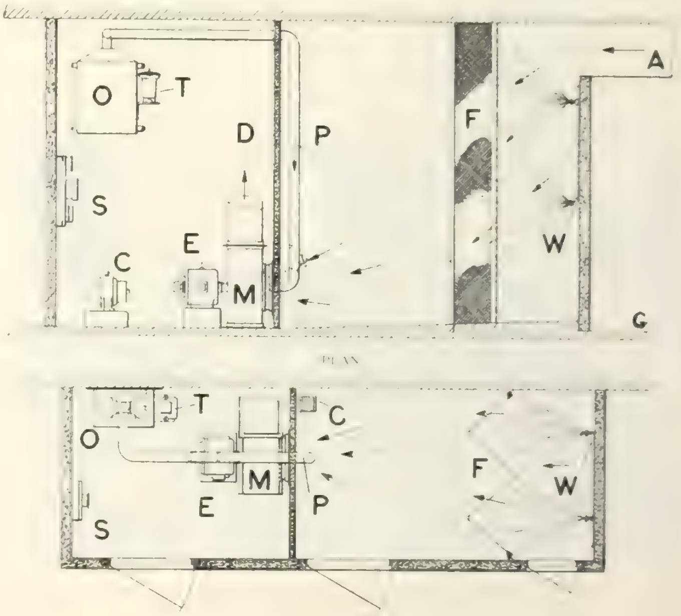


Fig. 2—Diagrammatic Arrangement

A—Fresh Air Inlet
W Water Sprays
M—Air Filter Screen
E—Mixing Chamber and Fan
S—Electric Motor
F Switchboard
O—Ozone Generator
P—Ozone Pipe
T Transformer
C—Converter*
D—Air Discharge
G—Gully for dirty water

*Required only where a continuous current supply is furnished.

Installations by the last two methods described above, have been fitted to some hundreds of buildings all over the world, including public and municipal buildings, blocks of offices, banks, hotels, theatres and picture houses, in the last of which in the Old Country, smoking is invariably allowed.

In conclusion it is interesting to note, that ozonair generators are in use for water sterilization, bleaching and deodorizing fats, waxes, oils, etc., bleaching wood pulp, brewing, food preservation and in short all indutsrial cases where air or material deordorization is necessary.

Public Roads and Highways Commissioners for Ontario

Mr. C. A. Magrath, C. E.

Mr. C. A. Magrath, C.E., is the son of the late Mr. Bolton Magrath, of Aylmer, Ont., Inspector of Protestant Schools in the province of Quebec. The son was educated as a land surveyor and some thirty years ago went to the Canadian Northwest to engage in his profession. After some experience in surveying and engineering Mr. Magrath became interested in the irrigation and railway interests in southern Alberta and for a number of years has been manager of the Alberta Coal & Railway Company at Lethbridge, which controls some of the mines and irrigation systems, and railways in the vicinity of that city.

For two terms Mr. Magrath was a member of the Old Northwest Legislative Assembly, and was for a time member of the Haultain Cabinet without portfolio. He was first elected to the Dominion House of Commons in the Conservative interest in 1908. Since 1911 Mr. Magrath has devoted himself nearly altogether to his professional work. He has been described, and not inaptly, as Canada's foremost irrigation engineer, and undoubtedly ranks foremost among those who have striven to develop what is known as the sub-arid districts of Alberta.

Mr. Magrath's standing as an engineer may be gathered from the fact that he was appointed by the Dominion Government to the Canadian section of the International Deep Waterways Commission, which has for the object of its investigation the deep waterways forming the boundry between Canada and the United States. By his experience, ability and eminence, Mr. Magrath justifies his appointment to the Ontario Public Roads and Highways Commission, and upon its first organization meeting was elected chairman of that body.

Mr. A. M. Rankin, M. L. A.

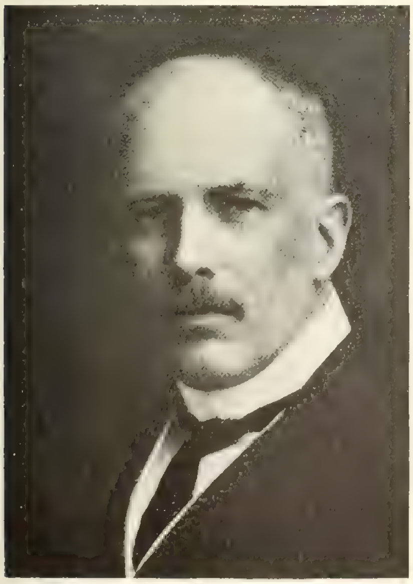
Another member of the Ontario Public Roads and Highways Commission is Mr. A. M. Rankin, M.L.A. for Frontenac County. Being actively interested in farming and milling operations near Collin's Bay, Ont., Mr. Rankin early turned his attention to the question of roads as a means of local transportation. For some time he has taken a very active interest in the improvement of the highways of his own county and in the general good roads movement. At the present time he is vice-president of the Good Roads Association, and it is largely owing to the activity of Mr. Rankin in this regard that the Provincial Government is, at this juncture, undertaking so large an expenditure for the improvement of roads and highways. Mr. Rankin has occupied a number of public positions, including that of reeve of the county of Frontenac, and at the last general election was elected member of the Provincial Parliament of Ontario.

Mr. W. A. McLean, C. E.

Mr. William Arthur McLean, C.E., is also a member of the new Public Roads and Highways Commission of Ontario. He entered the service of the Provincial Government in 1896 and was appointed to his present position in 1910. Mr. McLean was born at Belmont, Ont., and received his public school and collegiate education at Ingersoll, Strathroy and St. Thomas, and his university training at Toronto.

As a preliminary training in engineering work, Mr. McLean entered the office of the City Engineer of St. Thomas, where he obtained valuable experience and extensive practice in all phases of municipal work. For the last four years Mr. McLean has devoted himself to the conditions prevailing in the Ontario highways and is without doubt the best informed man on that question in the province. Mr. McLean is a member of the Canadian Society of Civil Engineers, the Association of Ontario Land Surveyors and the Engineers' Club of Toronto. He is also vice-president of the American Road Builders' Association and was a representative from Ontario at the recent International Good Roads Congress held in London. At the meeting of the Public Roads and Highways Commission Mr. McLean was elected secretary.

Reinforced concrete construction is just beginning to be used in Formosa. The capital city, Taihoku, is being practically re-built, 120 new business houses having been erected during 1912, and plans for 180 having been made for this year. Brick and stone are the more common materials, and are of local production. Concrete is gaining in favor, and it is expected that it will be used to a large extent in the future.



Mr. C. A. Magrath, C. E.

Mr. A. M. Rankin, M. L. A.

Mr. W. A. McLean, C. E.

Canadian Railroad Development

Double tracking on the C. P. R. will be completed to Swift Current by fall, according to a statement made recently by J. G. Taylor, general superintendent of the Saskatchewan division of the C. P. R. The double track is now in operation, west as far as Chaplin, 54 miles, and east to Regina, 42 miles.

The Northern Construction Company recently began the work of building the Pacific terminals of the Canadian Northern Railway at Port Mann. This work comprises a turntable with an 80-foot clearance, a roundhouse with 15 stalls and a possible extension to 60, and repair shops 140 ft. x 312 ft.

Construction work on the warehouses to be built on the new Great Northern Railway dock on Burrard Inlet, near the B. C. Sugar Refinery, which is now fast approaching completion, is to be started at an early date. The contracts for the understructure have just been awarded to the firm of Grant, Smith & McDonnell and material for the work is now being assembled ready for an immediate commencement.

The Minister of Railways has been asked to approve the plan for a new railway from the main line of the Canadian Pacific at St. Polycarpe Junction to the town of Cornwall, Ont., and the hearing on the route map application has been now arranged for. The company was incorporated last session under the name of the Glengarry and Stormont Railway, and the road is designed to serve several cross-country municipalities in those counties. It is about 30 miles long.

Stratford, Ont., is to have a new railway station. General Superintendent of Ontario Lines H. E. Whittenberger, and Industrial Commissioner Fitzsimons of the Grand Trunk Railway System, were in Stratford recently completing the arrangements for the new building, and the result is that a start on the construction will be made as soon as the materials are on hand. The new station is to cost $67,000, and will be a granite and pressed brick structure. It will be of a size that will meet the requirements of Stratford for some years to come and is to contain the offices of the officials of the Stratford division of the G. T. R.

The construction of the double track bridge across the Red River in Kildonan, on the Bergen cutoff, is being rapidly pushed forward. The substructure, which consists of seven piers and two abutments, is being put in by the Foundation Company of Montreal. These rest either on hardpan or solid rock. In some cases the concrete rests on the arch, and in others on the piles, the concrete in all cases being carried fifteen feet below the bed of the river. The superstructure will soon be commenced and is in the hands of the Dominion Bridge Company.

West Hartlepool, which lays claim to be the first municipal authority to produce electricity by means of waste heat, will open its new generating station in the course of two or three weeks. The two turbo-generators, each of 1,500 kilowatts, will be driven by exhaust steam from the furnace blowing engines of the Seaton Carew Iron Company, adjacent to whose works the station is built. In return for the exhaust steam, which has hitherto been blowing to waste in the air, the Seaton Carew Iron Company will receive free from the Corporation the supply of electric current needed for its works.

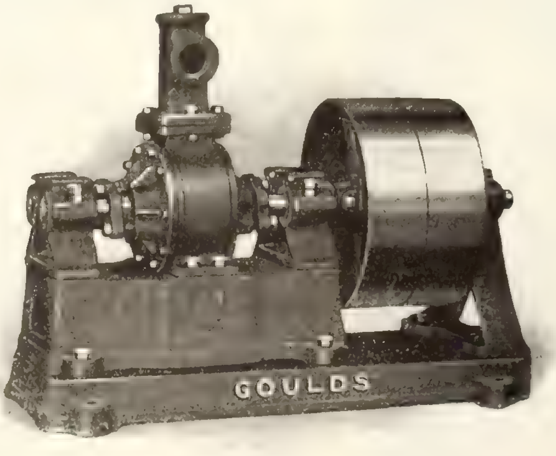
NEW ROTARY POWER PUMP

A new type of rotary power pump has just been developed by The Goulds Manufacturing Company, Seneca Falls, N.Y. This pump differs from the rest of the line of pumps of the same capacity in that gear style cams have been substituted for the three-toed cams used in the remainder of the line, as shown by one of the illustrations, and the gears on the end of the cam shafts have been eliminated.

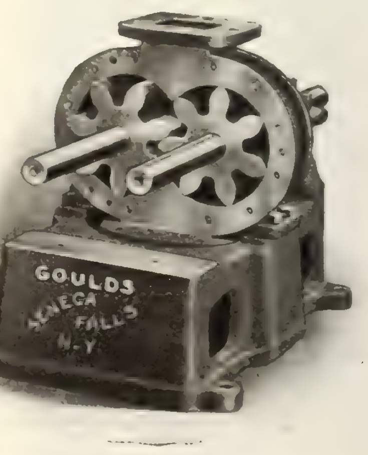
Two sizes are built: No. 1 has a capacity of 25 to 50 gallons per minute at 225 to 450 revolutions and No. 2 has a capacity of 50 to 100 gallons per minute at 225 to 450 revolutions. Both pumps are suitable for pressures up to 100 pounds or 230 feet elevation.

They are mounted on a cast iron bed plate, fitted with an outboard bearing and tight and loose pulleys for belt drive. The suction connection is made within the base directly beneath the case and is reached through hand holes in the base. No. 1 has two discharge openings, one tapped for pipe and the other threaded for hose couplings, No. 2 has three discharge openings, two fitted the same as No. 1, and the third fitted with an interchangeable blank flange. The suction is 3 inch on No. 1 and 4 inch on No. 2. Ths discharges are for 1½ and 2 inch pipe or hose respectively.

The Goulds line of pumps are for sale in Canada by The Canadian Fairbanks-Morse Company, Limited.



Goulds' new rotary pump.



Gear style cams.

CANADIAN PUBLIC HEALTH ASSOCIATION

The Third Annual Congress of the Canadian Public Health Association will be held in Regina, September 18th, 19th and 20th, 1913.

The following papers will be presented at the sectional meeting of Engineers and Architects, of which Mr. L. A. Thornton, B.A., B.Sc., City Commissioner of Regina, is Chairman;

(a) "Municipal Loans and Municipal Works," R. O. Wynne Roberts, M. Can. Soc. C.E., Consulting Engineer, Regina.

(b) "Hygiene of School Buildings, J. H. Puntin, L.R., I.B.A., Architect to the Regina Public School Board.

(c) "Results of Water Filtration at Saskatoon," Geo. T. Clark, B.A., A. M. Can. Soc. C. E., City Engineer, Saskatoon.

(d) "Sanitary Surveys of Rivers," J. R. Malek, C.E., Assistant Sanitary Engineer, Bureau of Public Health, Regina.

(e) "Sunlight in Cities," Theo. Brockmann, Dipl. Ingr. (Berlin), City Engineer's Office, Regina.

(f) "The Effect of Water Filtration; Biological and Chemical," H. W. Cowan, C.E., Toronto.

(g) Paper.—Title to be announced later, J. Antonisen, C.E., Superintendent, Brandon Municipal Railway.

(h) "Canadian Conditions Affecting the Design, Construction and Operation of Sewage Disposal Works," R. H. Murray, A.M. Inst. C.E., A.M. Can. Soc. C.E., Resident Sanitary Engineer, Bureau of Public Health, Regina.

In addition to the above, the following papers of particular interest to engineers will be presented at the general sessions:—

"The Smoke Problem," R. N. Blackburn, Wh.Sch., Chief Inspector of Steam Boilers for Saskatchewan.

"Standards With Reference to Sewage Treatment," T. Aird Murray, M. Can. Soc. C. E., Consulting Engineer, Toronto, Ont.

Engineers and public health officials intending to be present at the Congress, should notify the Local Bureau of Public Health, Regina.

Mainly Constructional

The News in Brief—From Coast to Coast

Plans for the $70,000 addition to the Windsor armory are practically completed and tenders will be called in the immediate future.

The John S. Metcalf Company, Limited, Montreal, have received a contract from the C. P. R. to make extensive alterations to elevator D at Fort William, Ont. The estimated cost is $50,000.

The Pacific Highway Association is accomplishing excellent work in improving the highways within its scope. Through its activity a continuous improved highway has been opened from the Mexican boundary to Hazelton, B.C.

An early beginning is to be made with the construction of the government dry dock at Levis, P.Q., the contractors being M. P. and J. F. Davis. It is estimated that the machinery required in the construction will cost about $2,750,000.

The Siemens Company is supplying 41 motors ranging from 185 h.p. downwards for the Acadia Sugar Refinery Company, Nova Scotia, in connection with the new plant. They are to be suitable for 3-phase, 60 cycle, 550 volt circuit.

The new building on Windsor street, Halifax, for St. Mary's College will be ready for the Christian Brothers by June, 1914. The plans are through and tenders are called for. The building will have a frontage of 90 feet, a depth of 38 feet and will be three storeys in height.

The town of Camrose, Alta., has displayed remarkable building activity during the past six months. Thirty-three new residences have been constructed and eleven new business houses. A new provincial Normal School and a government telephone building are well under way.

It will be necessary to flood 450 acres of land alone in Grantham township to build the new Welland Ship Canal, but this will be partly made up by 200 acres which the building of the new harbor at Port McCalla will create. The 450 acres will be expropriated. In and near Thorold, 27 acres will be back flooded, and one of the principal streets of the town will be largely used.

Owing to the higher cost of paving, the controllers of Montreal have asked for a further appropriation. The original estimates were based on prices that prevailed at the beginning of the season, when the city engineer secured the bulk of the work by underbidding the contractors. The city has now all the work it can handle, and did not compete for the last section of streets.

The Association of Metal Lath Manufacturers, Youngstown, Ohio, have issued a pamphlet containing the standard specifications for exterior plastering and showing the application of their product to this work. In these days where fireprofing is of the utmost importance and metals are taking the place of inflammable materials in construction, the metal lath is becoming a building material of great importance.

The Marine and Fisheries Department has decided to construct a new lighthouse on Main Duck Island, in Lake Ontario. The new building will have a steel and concrete tower and will be fitted with a powerful modern light. At present there is a light on the mainland, but the new light will afford a better guide. Tenders are being called, and it is proposed to have the lighthouse constructed before the season closes.

MacArthur Brothers Company, a firm of New York railway contractors, received the contract for the construction of the last section of the Kettle Valley Railway, which extends from the summit of the Hope range down the valley of the Coquitlam River to Hope, on the Fraser River, B.C. This section measures thirty-eight miles and includes some heavy rock work and will be completed by November 1, 1914, for something more than $3,000,000.

The recent excursion to Cleveland, Ohio, under the auspices of the Builders' Exchange of London, Ont., proved a most enjoyable outing. The excursion party, numbering in all about three hundred, left Port Stanley at 9 a.m. and arrived at Cleveland about 3 p.m. They were welcomed at the harbour by members of the Cleveland Builders' Exchange and conducted by street cars and automobiles to various points of interest in the city.

As a result of inspecting conditions in the west, Col. F. S. Meighen and W. W. Hutchison, president and vice-president respectively of the Lake of the Woods Milling Company, have decided that important extensions to their plant in the west are necessary in order to handle the growing business. Mr. Hutchison said last night that it was practically settled that another mill of large capacity would be built by his company in the near future, to cost $500,000.

Report comes from New York City that the Consolidated Gas Company found itself in possession of a building nineteen storeys high on either wing but only twelve storeys in the centre. The central part rests upon a foundation incapable of bearing the additional weight of seven storeys. The engineers in order to provide for the required seven storeys are to erect a bridge from one wing to the other and from this bridge intend to suspend a seven storey structure.

After an illness of only a few days Jacob Serson, provincial superintendent of bridges and resident of Kootenay for nearly 30 years, died last night in Nelson hospital. He was about 49 years of age. Mr. Serson joined the C. P. R. staff thirty-eight years ago and soon become noted for his work in bridge construction. About eight years ago he was appointed provincial bridge superintendent for British Columbia.

Mr. E. G. M. Cape, Montreal, has been awarded the contract for the construction of a new factory and office for the Imperial Wire & Cable Company, Montreal. The buildings have been commenced on the site at St. Patrick street. The factory and offices will comprise several structures, the principal being one of eight storeys. When completed, the factory will be one of the largest and best equipped in Canada. The machinery will all be run by electric power.

The new ferryboat Essex, built for the Detroit and Walkerville Ferry Company, for service between Walkerville and Detroit, will be delivered to her owners shortly by her builders. Much is expected of the new ferry towards relieving the congestion of passenger and vehicle traffic which exists both on the Walkerville and Windsor routes, especially when race meetings are held in Windsor. The Essex was built with a view to accommodating a full deckload of vehicles and as an ice crusher, and cost $75,000.

A catalogue on brick fireplaces issued by the Thomas Moulding Company, Chicago, has come to hand. The term catalogue is scarcely descriptive of this artistic booklet. A great variety in the design of fireplaces is shown and to each is given the name of some prominent English or American writer. There is a fitness in the name, too, as the fireplace seems to carry one back to some phase of the author's life. The catalogue contains considerable suggestive material for those who contemplate building.

For months the Canada Cement Company has been preparing plans and making preliminary arrangements for the construction of the huge 4,000 bbl. plant south of Medicine Hat. Over 100 men are now at work on this plant, and the number is being increased almost every day. The siding on the Crow's Nest Line has been named Delaine and a depot established there. Some idea of the immensity of this industry can be gained as the buildings will cover something more than twelve acres when completed.

Some very large contracts are about to be awarded by the government. Tenders for the Toronto Harbor Works, to cost six million dollars, and each requiring a deposit of $300,000, will be in on the 23rd. Proposals for the second contract on the Welland Canal, estimated at four million dollars, will be received on the 27th, and for the first section of the Severn River end of the Trent Canal on the 25th. Owing to the magnitude of the works and the large deposits required only large firms will be in a position to tender on the original contracts.

According to telegraphic advices received in Calgary from Edmonton recently, Calgary has been decided upon as one of the places at which the Dominion government will erect internal terminal elevators. The announcement was made at Edmonton recently by Minister of Public Works Robert Rogers, of the Dominion government. The elevator site is in East Calgary, where connection with the C. P. R., the C. N. R. and G. T. P. is convenient. The elevator is to be of 3,500,000 bushels capacity and will cost to erect in the neighborhood of $1,500,000.

Although the building permits taken out in Montreal show a considerable increase in value as compared with last year, there has been a decided falling off in actual construction. The demand for houses is greater than ever, and probably this class of building has not been affected to any extent by the monetary situation. It is the extensive schemes which have been held up, pending easier money. The supply houses have naturally felt the decline in the contracting trade, and there is not the shortage in materials which characterized last season's building.

The Dominion Engineering & Inspection Company of Montreal has been retained by Messrs. Ross & McDonald, architects, for the inspection of the structural steel and cement, for the Central Technical School and the Royal Bank Building, Toronto. The company has decided to establish a permanent branch in Toronto, under the management of Mr. C. A. Meadows, designing engineer for the Geo. B. Meadows, Toronto, Wire, Iron and Brass Works, Company, Limited, and will conduct a general inspection and cement testing practice there.

We desire to acknowledge the receipt of the Proceedings of the Ninth Annual Convention of the American Road Builders' Association. The report contains a number of very excellent papers upon many phases of road building, contributed by the leading roadway engineers of Canada and the United States. In these days when the question of road making is so much to the front and we are beginning to realize the importance of our highways as a means of intercommunication, much that will stimulate discussion and aid in the practical work will be found in this volume.

"Steam Power Plants" is the title of an unusually attractive forty-two page booklet recently published by Lockwood, Greene & Company, architects and engineers, for industrial plants, 60 Federal street, Boston. It describes in detail the construction and equipment of a few of the many well-known power plants designed by this concern. Unusually clear illustrations of both the exteriors and interiors of the plants are shown. Those interested in industrial power plant construction and equipment may obtain a copy of this booklet by addressing Lockwood, Greene & Company, 60 Federal street, Boston.

Paving contractors are so loaded with work in Toronto this year, that it is probable that a larger number of pavements than usual will have to stand over until next year. The city also has a large number of contracts on its hands, and Deputy Engineer Powell says that it has all it can handle until snow flies. The commissioner has made 734 recommendations of roadway works this year, and of that number 175 have been let and are under way. Three hundred and seventy-three have been completed in 1913, including 311 left over from last year. Sixty-two have been recommended and completed this season.

The Canadian Allis-Chalmers, Limited, Toronto, selling agents for the Foos Gas Engine Company, have issued Bulletin No. 89, descriptive of the engines manufactured by this company. The booklet is attractive in form and illustrated with a number of very clear cuts and contains excellent descriptions of the structural operation of these engines. The matter dealt with is the application of these engines to the driving of pumps both for irrigation and deep well work. Extensive tables are given showing the consumption, power and work done by the various sizes of these engines. The bulletin will repay close study.

The Neptune Meter Company, with main office at 90 West Street, New York City, have published a neat little booklet entitled, "Trident Reliability." The booklet contains cuts of some of the meters manufactured by the company and gives the principle upon which the company claims to operate, namely, to build a meter that will be accurate within close limits under all conditions of service and to make it so well that it will retain its accuracy over the largest period of time without any necessity of attention or repairs. The patent roller thrust bearing of the Trident disc piston which counteracts the thrust and eliminates the wear on the piston itself, is also described.

That tenders will be invited for the construction of the new armory at Victoria, B.C., which is expected to cost about $250,000 when completed, was announced recently. The armory is to be situated at the corner of McBride and Bay streets, and will provide twice as much accommodation as that now in use. It will be two storeys in height and will be provided, besides, with a basement. Its actual floor space, outside altogether of that taken up by the armories, staff quarters, etc., will be 200 x 100, which will give plenty of room for massed drills, etc. In the basement will be laid out miniature rifle ranges, a gymnasium, and other facilities for the training and entertainment of members of the corps.

A large crew of men is at work clearing the site of the Dominion Powder Company's plant a half mile north of Abbotsford, B.C., while contracts have been let for the erection of no less than ten concrete buildings in which the various safety powders will be manufactured and stored. Work of erection will start as soon as the site of ten acres is cleared, and Manager Israels expects to have one unit of the plant erected and in operation this autumn. This portion of the plant will manufacture stumping powder only, and the company expects to have its product in the hands of Fraser Valley ranchers before Christmas. Clearing operations and the erection of buildings and installation of machinery will keep a large crew of men busy here for some months.

With a view to provide accommodation for the large number of people who require temporary office accommodation, the General Agency and Information Bureau, Limited, have secured the eighth floor of "La **Sauvegarde**" Building, Notre Dame and St. Vincent streets, Montreal, one of the many fine office buildings recently erected in the business section of the city. A large number of offices has been provided on this floor and these may be rented by the day, week, month or a definite period as may be required. If an office is not desired, desk room in a common hall may be secured. The Bureau also provides information dealing with the financial firms, a board room, stenographer and typewriter, safety boxes, telephone and telegraph office, parcel office and many other conveniences to be found in the best equipped office buildings.

Tar spraying seems a very brief palliative of dust, though it is said that oil tar, being more liquid than coal tar, will penetrate a road surface and effect more durable benefit. The pneumatic tire called forth the aid of tar to prevent the suction effect of the tire as made manifest by the scabbing of the surfaces. But the original pneumatic tire had no steel studs such as now rasp up the road surfaces, perhaps as badly as the hoofs of the horse. We are at least beginning to learn that a road surface must be constructed on a strong foundation, that it should be more than broken stone closely packed, that its particles must have positive coherence or inter-adhesion, and that the surface must shed water, while a heavy wheel must not cause detrusion.

The government has returned his deposit check to Michael Sullivan, the Kingston contractor, who was the successful tenderer for the erection of new barracks at Long Branch, near Toronto. This cancellation of the contract has given rise to a rumor that new barracks will be built instead in Montreal, and the permanent force concentrated in that city. Inquiry at Ottawa elicited the information that the cancellation of the plans for the proposed new barracks at Long Branch does not mean that no buildings are to be erected there. On the contrary, it is officially stated here that the work will be pushed vigorously forward. The plans called for an expenditure of something like a million and a half, and provided accommodation for eight hundred to a thousand men. This scale was found to be much in advance of the requirement.

A big manufacturing industry is to be established in Ottawa by Mr. M. J. O'Brien, of Renfrew, in connection with his mining interests. A statement to this effect was made in a letter to the board of control in which he asks that the city sell him the end of Aberdeen street. Mr. O'Brien owns the property on both sides of this street which runs into the C. P. R. track, and he desires to acquire the street end so that he may erect a building running along the C. P. R. track for siding accommodation. In making the application for the street end the statement was made that Mr. O'Brien intends to concentrate the manufacturing end of his mining interests and instead of the plants in Eastview, Papineauville, and other places will have one large plant in Ottawa.

Three bridges constructed under the direction of the Massachusetts Metropolitan Park Commission were built with roadway surfaces of creosoted wood blocks. The three bridges are the Saugus River Bridge, the Wellington Bridge and the Western Division Bridge, the two former being pile bridges, each containing a movable span which is surfaced with a spruce plank floor, and the latter a plate girder. The sub floors of the two first named were composed of 6-inch hard pine covered with 1-inch of waterproofing. A 1-inch sand cushion was used in both instances. On the Saugus River Bridge 3-inch blocks were laid, while on the Wellington Bridge 4-inch blocks were used, the bridges being thrown open to travel in 1905 and 1904 respectively. The sub floor of the Western Division Bridge, which was completed in 1905, is composed of 4-inch planks, waterproofed on the surface, and 4-inch blocks laid on a 1-inch sand cushion form the wearing surface. The cost of the blocks and laying in the two first named bridges was about $2.25 per square yard. In the Western Division Bridge the cost of the blocks, including laying and waterproofing of the sub floor, was $2.75 per square yard. The Western Division and the Saugus River Bridges carry a pleasure vehicle traffic. The Wellington Bridge, however, is subjected to a heavy mixed traffic. In each instance the present conditions of the surface is said to be excellent and no maintenance work has been necessary.

Personal Mention

The general manager of the Boving Company of Canada, Mr. Henry F. Clayton, is making a business trip of a month's duration in the Canadian Northwest.

Mr. R. F. Uniacke, the chief engineer of the Transcontinental Railway, has completed his inspection of the bridges and general condition of the road as far west as Winnipeg and has returned to Ottawa.

Mr. J. G. McMillan, B.A.Sc., who for the past five months has been in the James Bay region for the Provincial Government of Ontario looking for suitable harbor location for the terminus of the T. & N. O. Railway, has returned to Toronto. The work of taking soundings in the bay has been completed.

James D. Robertson, formely sales manager for the Pittsburgh Valve, Foundry & Construction Company, has again assumed charge of the sales of this company, returning as second vice-president after two years' absence. During those two years Mr. Robertson successfully launched in business the Warren Tool & Forge Company, of Warren, Ohio. At the time of his withdrawal from the Pittsburgh Valve, Foundry & Construction Company, two years ago, Mr. Robertson had spent twenty-one years with that institution.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Waterworks, Sewerage and Roadways

Calgary, Alta.
Engine house, cost $8,000, West, planned by City Council Waterworks Dept. Engineer, Geo. Craig. One storey, 236 x 56, brick and reinforced concrete construction, cement foundation, felt and gravel roofing, steam heating, motors and generators, engine, pumps, transmission.

Goderich, Ont.
Council has decided to lay a new water main on St. Andrew St., and contemplates laying another to the Wells Survey. Reeve, B. C. Munnings.

Montreal, Que.
Board of Control has asked for $19,000 to complete trunk sewer in Longue Pointe Ward. Sec., L. N. Senecal.

Sewer, cost $4,000, Outremont (Wiseman between Ducharme and C. P. R.), planned. Sec.-Treas., Mr. Sampson. Engineer, Mr. Duchastel, Town Hall. Tenders will be called shortly.

Montreal Tramways Co., A. E. Robert, president, will start work immediately on repairing roads in Lachine which are out of repair, over which tracks run. Sec.-Treas., H. Charette.

Paving, planned by Board of Commissioners. Sec., L. N. Senecal. Tenders submitted from following firms: Warner, Quinlan Asphalt Co., 745 St. Catherine W.; Sicily Asphaltum Paving Co., St. Viateur St.; Bitulithic Paving Co., 745 St. Catherine W., for asphalt paving, and The Canadian Creosote Co., for two streets to be paved with wood. Contracts not yet awarded.

Pump station, Lachine (Summerlea), contemplated by Town Council. Sec.-Treas., H. Carette. Site suggested and plans will be prepared.

Montreal South, Que.
Concrete roadway contemplated by Municipal Council. Board of Trade are taking active steps to have work started.

Sewage system planned by Municipal Council and Board of Trade.

The Board of Trade are taking active steps to have a waterworks system installed.

Oshawa, Ont.
Plans will be prepared shortly for sewers from Simcoe St. to Ross Corners. Clerk, Thos. Morris.

Pt. Edward, Ont.
Granolithic walks planned by Town Council. Clerk, Jno. F. O'Neil. Work will start at once.

Powassan, Ont.
Storm sewers, 1,400 feet, Main, Edward and Clark streets, planned. Clerk, L. G. Phillips.

Regina, Sask.
Centrifugal pumps for Light and Power Dept. Supt., E. W. Bull. General contractors, Canadian Allis-Chalmers Ltd., Winnipeg. For 2 vertical shaft, motor driven centrifugal pumps to operate against 22 ft. head, capacity 12,500 gals. per minute each.

St. Catharines, Ont.
Concrete sidewalks on Head, Hillcrest, Lake, Cherry, Wiley, Carlton, St. Paul, Calvin, Lisgar, Ontario and Crown Sts., planned. Cost $7,000. Clerk, J. A. Pay. Engineer, W. P. Near.

City Council plan 10 in. tile sewers in Myrtle and Division streets and Welland Ave. Cost $3,500. Clark, J. A. Pay. Engineer, W. P. Near.

Walkerville, Ont.
Tenders received by Clerk, Cecil H. Robinson, until September 2nd, for 10 lots of sewers. Plans, etc., on application to Owen McKay, engineer.

Brantford, Ont.
City Council plan sewers in 12 streets as recommended by Board of Health. Clerk, H. F. Leonard. City Engineer, T. Harry Jones.

Kingston, Ont.
Council passed by-law to lay asphalt block pavement on Wellington street from William street to the Park. Mayor, T. J. Rigney. Engineer, R. J. McClelland.

Leamington, Ont.
Council plans to pave Erie and Talbot streets. Material to be selected. Councillor Brown in charge.

Montreal, Que.
It is proposed to widen Notre Dame street from 60 to 80 feet for a distance of 2,000 ft. The Electric Service Commission will prepare report for underground conduits for this part of street. Board of Commissioners. Secretary, L. N. Senecal.

CONTRACTS AWARDED

Ingersoll, Ont.
Cement curbs and gutters on Thames street planned. Clerk, W. A. Smith. General contractor, Fred Hagen.

Islington, Ont.
Sidewalks planned by Twp. of Etobicoke. Clerk, J. A. MacPherson, Islington, Ont. General contractor, Walter Buckhurst, walks on Queen street at 98c per lin. ft. Scott & Fisher, walks on Fishers Road, Percy & Mellwood streets, at 66c per ft. and 85c per ft. at crossings.

London, Ont.
Pavements planned by Board of Works. Chairman, B. W. Bennett. Engineer, W. N. Ashplant. Work will be done by day labor.

Asphalt pavement, Horton, from Talbot to Wellington streets, on 2-in. concrete base, planned by City Council. Chairman, Board of Works, B. W. Bennet. Engineer, W. N. Ashplant. General contractors, Foley & Gleeson, Ottawa $11,000

Montreal, Que.
Roadway to Quebec City planned by Prov. Govt., Dept. of Public Works. Sec., Alphonse Gagnon, Que. General contractor, H. Beauregard, 70 St. James street, Montreal. Contract for twent miles sublet to Alberto Dini, 421 Cadieu street, Montreal, from Charlemagne t Lavaltree. Sub-contractor has sublet t two contractors Milo and Costa of Mtl

Contracts awarded to Henri Bertrand 2727 St. Hubert, for sewers in Montcaln $1,256, Tellier, $1,798, Chestnut, $1,040 and Duquette, $840.50. To Papuin & Dannoset for sewer in Grand Blvd., $3 180.80; to Z. Corbeau, 2502 Chateaubriand, for sewer in Clifton street, 304; to A. J. A. Chagnon, 1216 des Erables, for sewer in Regent street, $3,157, and St. Dominique street, $18,900, to Jno. H. Leahy, 123 Valois for sewer in Boyce, $7,580. Secretary, L. N. Senecal.

Brick sewer, cost $13,014, 111 yards. Outremont, Wiseman ave. Sec.-treas Mr. Sampson. General contractors, R T. Smith & Co., 175 Metcalfe ave. Engineer, Mr. Duchastel.

Ottawa, Ont.
Valves, etc., required by Waterworks Dept. Engineer, Archibald Currie, City Hall. Check valves, General Supply Co., 356 Sparks street. Gate valves, McDougall Ltd., 529 Sussex street. Steel tubes, Mannesman Tube Co., Ltd., Mont.

Intake pipe, cost $40,000, planned by City Council, Waterworks Dept. Mayor, J. A. Ellis. City Engineer, Archibald Currie. General contractors, Loamis McBean & William, Montreal, for lifting, repairing and relaying old and new intake pipes in Ottawa river.

Petrolia, Ont.
Sewage outlet, cost $3,915. Mayor Pollard. Engineer in charge, Mr. Jones. General contractors, Kettle, Jennings & Howlett.

Quebec, Que.
Roads—General contractors, Cairnie & St. George, C. P. R. Telegraph Building, Montreal, for roadwork between Quebec and Rousses Point. Prov. Govt., Dept. of Roads. Deputy Minister, B. Michaud., Quebec.

Thorold, Ont.
Pavements planned by Town Council. Mayor, Jno. Broderick. Clerk, D. J. C. Munro. General contractors, Asphaltic Concrete Company, 74 King E., Toronto, and Warren Bituminous Paving Co., of Ontario, Ltd., 103 Bay street, Toronto.

Winnipeg, Man.
Two turbine pumps, cost $13,590, planned by Board of Control. Secretary, M. Peterson. Engineer, H. N. Ruttan, 223 James ave. General contractors, Canadian Allis-Chalmers, Ltd. Two No. 6

3-stage Mather & Platt patent high lift turbine pumps; two Escher Wyss tube, 3-stage single suction pumps.

Railroads, Bridges and Wharves

Amable, Ont.
C. N. R. Co.'s location of station at Amable, Ont., Twp. Pentland, Dist. of Nipissing, at mileage 188.5 from Ottawa, has been approved.

Calgary, Alta.
C. N. R. Co. has been authorized to construct spur for Hyman & Co.

Twp. of Carden, Ont.
County Council plan construction of reinforced concrete bridge across the narrows of Mud Lake, Twp. of Carden, Co. of Victoria. Steel will be purchased and supplied by the municipalities interested. Plans, specifications, etc., at office of County Clerk, Lindsay, Ont., who will receive tenders.

Coyle, Ont.
Toronto, Hamilton & Buffalo Railway Company has been authorized to construct bridge over the Welland River at Coyle, Ont.

Fraser River, B.C.
Dredging at the North Arm of Fraser River. Tenders received by Dom. Govt., Dept. of Public Works, Secretary, R. C. Desrochers, Ottawa, until Sept. 30th. Plans, specifications, etc., at offices of C. C. Worsfield, Dist. Engineer, New Westminster, B.C., W. Z. Earle, Winnipeg, Man., J. S. MacLachlan, Victoria, B.C., U. L. Michaud, P. O. Bldg., Montreal, P.Q., J. G. Sing, Confederation Life Bldg., Toronto, and Postmaster at Vancouver, B.C.

Hawkesbury, Ont.
Grand Trunk Railway Company has been authorized to construct two branch lines to the premises of the Riordan Pulp & Paper Company.

Kincardine, Ont.
W. Mason, c/o A. Ingram, Juniper Knoll, contemplates erecting bathing houses, docks and building a new steam pleasure yacht.

Lindsay, Ont.
Railroad extension for C. P. R. Plans being prepared for building of a second track from near Lindsay station to the junction at the eastern end of the town, and the building of a cement wall along the Scugog River beside the line.

Montreal, Que.
G. T. R., McGill street, plan to widen top of Rockfield bridge, Lachine, 10 ft. each side and erect iron fence.

C. P. R. Co. has been authorized to construct spur into premises of the General Fire Extinguisher Co.

Norwood, Ont.
C. P. R. Co. has been authorized to construct bridge No. 5.7 over Hill street, Norwood, Ont.

Prince Albert, Sask.
C. N. R. Co. has been authorized to construct spur into premises of McKenzie Ellis & Co.

Pitt River, B.C.
Wharf planned by Prov. Govt., Dept. of Public Works. Minister, Hon. Thos. Taylor, Victoria. Will be built one mile above C. P. R. bridges, have one approach 180 ft. long and be 40 x 60.

Toronto, Ont.
C. P. R. Co. has been authorized to make alterations to foot bridge at Wallace ave., to carry it over the third track which the C. P. R. is now constructing from Parkdale to West Toronto.

Vails' Point, Ont., Grey Co.
Tenders received by Dom. Govt., Dept. of Public Works, Secretary, R. C. Desrochers, Ottawa, until Sept. 15th for construction of wharf at Vails' Point. Plans, specifications, etc., at offices of J. G. Sing, Dist. Engineer, Confederation Life Bldg., Toronto, J. H. Armstrong, Dist. Engineer, Midland, Ont., Postmaster at Vails' Point and Dept., Ottawa.

Wallaceburg, Ont.
Freight sheds, cost $6,000, for Chatham, Wallaceburg & Lake Erie Railway. Manager, Wm. Norris, Chatham. One storey, white brick construction. Plans in progress.

Winnipeg, Man.
C. P. R. Co. has been authorized to construct spur for J. Gunn & Sons.

CONTRACTS AWARDED

Cardigan Bridge, P.E.I.
Bridge, cost $4,000. Prov. Govt., Dept. of Public Works. Secretary, L. B. McMillan, Charlottetown. General contractors, MacKinnon Holmes & Co., Drummond Road, Sherbrooke, Que. Two spans, 80 x 16 ft.; 4 ft. sidewalk. Creosoted pile substructure and steel superstructure.

Chesley, Ont.
Contract for cement abutments for Boundary line bridge awarded to David Keys at $5.20 per cu. yd. Steel bridge with floor awarded to Hunter Bridge Co., $2,150. S. K. Ewart, Reeve, Chesley, Ont.

Edmonton, Alta.
Addition to C. N. R. freight sheds, cost $6,500. Company's architect prepared plans. General contractors, Duncan & MacDonald, C. N. R. One storey, 40 x 200, frame construction, cement block foundation. Foundations started.

McCann, N.S.
Dam for the Maritime Railway & Power Company. General contractors, The Ambursen Hydraulic Construction Co., Ltd. New Birks Bldg., Montreal, Que.

Mulgrave, N.S.
Dredging, cost $11,600, planned by Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractors, the Coastal Dredging Company.

Province of Ontario.
Double tracking railway from a point near Islington to Guelph Jct., planned by C. P. R. General contractors, Johnson & Girouard, Ottawa.

Prince Albert, Sask.
Dam planned by City Council. General contractors, Ambursen Hydraulic Construction Co., New Birks Building,

Peterboro, Ont.
Two concrete bridges, cost $6,750, McDonnel and Park street, planned by City Council. Chairman, Board of Works, Wm. Buller. Engineer, R. H. Parsons. General contractor, W. H. Lytle.

Quebec, Que.
Dry dock, Lauzon, planned by Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractors, M. P. & J. F. Davis, 14 St. Peter street. Excavations 65 ft. deep by 1 ft., 200 x 60, will have to be made through solid rock. Contractors may require machinery for drilling, also steam shovels, etc.

Swift Current, Sask.
Dam, cost $86,000, planned by Town Council, Secretary, Geo. D. Arnott. Engineer, Geo. D. Mackie. General contractors, Ambursen Hydraulic Construction Co., 823 New Birks Bldg., Montreal. Work will be done on percentage basis. Tenders will be called shortly for pipe line, estimated cost $10,000. Contingencies, etc., $8,000.

Walkerton, Ont.
County Council plan general repairs to bridges damaged by floods. General contractor, A. G. Hampson.

Public Buildings, Churches, Schools, etc.

Athabasca, Alta.
Town Council will erect hall for immediate occupation, constructed so that it may be utilized for fire hall when a modern town hall is erected. Cement construction.

Calgary, Alta.
Elevator, cost $1,500,000, planned by Dom. Govt., Dept. of Trade & Commerce. Deputy Minister, F. C. T. O'Hearn, Ottawa. Will have capacity of 3,500,000 bushels.

Chesley, Ont.
Interior fittings for post office. Tenders received by Secretary, R. C. Desrochers, Ottawa, until Sept. 4th. Plans, specifications, etc., at offices of W. Halliday, Clerk of Works, Chesley, T. A. Hastings, Clerk of Works, Postal Station "F," Toronto, and Department of Public Works, Ottawa.

Dresden, Ont.
Tenders received by Secretary, Thos. Convay, until noon, Sept. 2nd, for erection of Carnegie Free Library. Plans, specifications, etc., at office of architect, W. A. Mahoney, Guelph.

Fort William, Ont.
Armory, Walsh street, planned by Dominion Govt., Dept. of Militia & Defence. Secretary, E. F. Jarvis, Ottawa. Two storeys and basement, 243 ft. 9 in. x 140 ft. 10 in., brick construction. Hardware floors, rifle range, bowling alley. Plans, specifications, etc., at office of City Clerk. and Department, Ottawa. Tenders received by secretary till Sept. 4th.

Goderich, Ont.
Addition and alterations to "Red Star" Moving Picture Theatre planned. Seating required. David Brown, owner.

Medicine Hat, Alta.
Church residence, cost $5,000, Ottawa St., for Methodist Church. Pastor, Rev. J. W. Morrow. Architect, G. Fisher, 90

Ottawa street. Two storeys, 30 x 40, brick, cement foundation. Plans drawn.

Montreal, Que.

Church for Notre Dame de Grace Methodist Congregation. Pastor, A. S. Doggett, c/o Rev. W. E. Baker, 48 Arlington street. Plans in progress.

Tenders received by secretary, R. C. Desrochers, Ottawa, Dom. Govt., Dept. of Public Works, till Sept. 8th, for addition to fittings for Postal Station "B" Plans, specifications, etc., at offices of R. L. Deschamps. Overseer, M-1 Central Post offices and Dept., Ottawa.

Dom. charter has been granted to the Arcade Film Theatre Ltd. Interested, M. J. McLaughlin, 106 St. Matthews St. Capital $25,000. To construct theatres, etc.

Alterations to convent, cost $27,000, Outremont, 314 St. Catherine Rd., for Soeurs Missionaires de l'Immacules Conception, 314 St. Catherine Rd. Architect, Chas. Chausse, 17 Pagnuelo. Carpenter, Jos. Collette, 202 Chateauguay. Roofing, heating and plumbing, D. Benoit, 1975 St. Lawrence. Private tenders called for plastering and painting. Contract to be awarded about Sept. 6th.

Church and presbytery planned by English Catholic Church Congregation of Verdun. Rev. Mr. McDonald, 48 Church.

Fire station, Lachine, Dominion Park, planned by Town Council. Sec.-treas., H. Charette.

Church, Fullum, for Parish of St. Eusebe, c/o Rev. H. J. Robillard, 641 Fullum. Architect, Beaubien Champagne, Ecole Polytechnique, 228 St. Denis. Tenders will be received by architect this week for work only, part material supplied. 70 x 90 x 250.

Boiler house, Point St. Charles. Tenders submitted as follows: J. L. Simmons, 538a Lasalle Rd., $6,225. Thos. Wand, 326 Laval ave., $6,576; East Construction Co., $7,605. Murray & McRitchie, 20 St. Nicholas, $8,400.

Post office fittings. Tenders received by Dom. Govt., Dept. of Public Works, Secretary, R. C. Desrochers, Ottawa, till Sept. 4th, for addition to registration office, fittings and furniture for Central Post Office. Plans, etc., at office of R. L. Descamps, Overseer of Public Bldgs., Montreal, and Dept., Ottawa.

Garbage reduction plant planned. R. S. Lea, New Birks Bldg., Montreal, is preparing a report for Board of Control for a more economical disposal of city's garbage, capacity over 700 tons per day. Secretary, L. N. Senecal.

Moose Jaw, Sask.

Elevator planned by Dom. Govt., Department of Trade & Commerce. Deputy Minister, F. C. T. O'Hara, Ottawa, Ont. Tenders received until September 8th. Plans at office of Dept. and from Board of Grain Commissioners, Fort William.

Ottawa, Ont.

Addition to Carnegie Library, Metcalfe, contemplated. Chief Librarian, W. J. Sykes. Mayor, J. A. Ellis. To knock out wall and extend reading and reference rooms. Plans in progress.

Addition and alterations to church, cost $4,400, Lower Town, for Roman Catholic Corporation of Ottawa. Architect, Chas. Brodeau, 63 Alma street, Hull. Brick construction and foundation. Plans in progress.

Regina, Sask.

Theatre, Broad and 11th ave., for Geo. Broder, Victoria ave. 75 x 125, brick and stone construction. Plans in progress.

Saskatoon, Sask.

Terminal elevator planned by Dominion Govt., Dept. of Trade and Commerce. Deputy Minister, F. C. T. O'Hara, Ottawa, Ont. Tenders received until Sept. 8th. Plans at office of Dept. and from Board of Grain Commissioners, Fort William.

Toronto, Ont.

Heating, plumbing, ventilating and electrical work in Deer Park School. Tenders received by Sec.-treas., W. C. Wilkinson, Board of Education, until August 29th. Plans, specifications, etc., at office of Supt. of Buildings, City Hall. Chairman of Comm., W. O. McTaggart.

Tenders received by Sec.-treas., W. C. Wilkinson, Board of Education, until Aug 29th, for construction of new school building on Homewood ave. Plans, specifications, etc., at office of Supt. of Buildings, City Hall. Chairman of Committee, W. O. McTaggart.

Victoria, B.C.

Museum planned by Prov. Govt., Department of Public Works. Minister, Hon. Thos. Taylor. Architect, F. M. Rattesbury, 621 Sayward Bldg. Four storeys, 90 x 260, structural steel and stone construction. Site has been secured.

Winnipeg, Man.

Tenders addressed to A. Johnston, Deputy Minister of Marine & Fisheries, will be received until Sept. 12 for construction of Range Light Towers at the mouth of Red River (new channel). Plans, specifications, etc., at the Dept., Ottawa, and Selkirk, and post offices, Selkirk, Winnipeg, St. Boniface and Gimli.

CONTRACTS AWARDED

Blackstock, Ont.

Drill Hall, cost $12,500, planned by Dom. Govt., Dept. Militia & Defence. Secretary, E. F. Jarvis, Ottawa. General contractor, W. A. Tom, Collingwood, Ont.

Brockville, Ont.

Nurses' Home, cost $63,500. Provincial Govt., Dept. Public Works. Secretary, H. E. McNaughton, Toronto. General contractor, W. P. Driscoll. Three storeys, brick construction. Foundations in.

Addition to school, cost $2,500, New West Ward School. General contractors, Parslow & Horton. Plumbing and heating, Geo. Ross & Co. Two storeys. D. Spidal, Chairman School Board.

Addition to Old West Ward School, cost $3,000. Chairman, Dom. Spidal. General contractor, Fred Clow. Heating and plumbing, Geo. Ross & Co. Two storeys.

Edmonton, Alta.

School, cost $150,000. Secretary, M. Brady. Architect, G. E. Turner, Mortlake Block. General contractors, Read, MacDonald & Brewster, Tegler Block. Heating and plumbing, Edmonton Sheet Metal Works, 3rd street. Electrical work, Burnham Frith Electrical Co., Rice street. Stone, Bedford Limestone Co., Bedford, Indiana.

School, cost $3,500, Norwood Extension. Sec.-treas., Mr. Bradey. Architect, Mr. Turner, Mortlake Block. General contractors, Geary & Jamieson, 622 1st street. Two storeys, fireproof construction. Foundations in.

Hamilton, Ont.

Addition to school, cost $5,000, Dundas Road, planned by Twp. School Bd. Architects, Rastrick & Son, 31 King St. E. Mason, Wm. Aldridge, 28 Hunt St. Carpentry, Jno. Mills, 167 Herkimer St. Roofing, M. V. McLean, 314 Hess St. S. Painting, C. King, 32 Caroline N. One storey addition, 67 x 40, brick constr.

Indian Head, Alta.

Drill Hall, cost $13,700. Dom. Govt., Dept. of Militia & Defence. Secretary, E. F. Jarvis. General contractor, Jas. McDiarmid, Winnipeg.

Marysville, N.B.

Church, cost $7,000, for Methodist Congregation. Pastor, Rev. Thos. Hicks. General contractor, Alfred C. Higgs, Nappan, N.S. Foundations in.

Moncton, N.B.

Church, cost $52,200, Queen & Church, for First Moncton Baptist Congregation. Architect, Secretary of Trustees, W. H. Chappell, Charlottetown, P.E.I. General contractor, J. M. Clark, New Glasgow, N.S. 135 x 100, Sackville sandstone, brick construction.

Montreal, Que.

Repairs to Medical Bldg., cost $5,000, for McGill University, c/o M. Vaughan. General contractor, Geo. Roberts, 79 Lagauchetiere W.

Fire station No. 25, cost $50,000, Drummond, planned by Board of Commissioners. Fire Chief, Mr. Tremblay. Architects, Cox & Amos, E. T. Bank Bldg., St. Catherine St. W. General contractor, masonry, carpentry, plastering and painting, E. G. M. Cape, New Birks Bldg. Steel, Dom. Bridge Co., Dom. Express Bldg. Roofing, Richardson, Simard & Co., 745 Clarke. Heating and plumbing, J. J. Briard, 1277 St. Dominique. Electrical work, Phillip Lahee & Co., 20 St. Nicholas. Marble and tile, Robt. Reid, 125 St. Alexander.

Ottawa, Ont.

Parish Hall, cost $18,000, Percy and 4th ave., for Roman Catholic Corporation of Ottawa. Rev. Father Whilan, Nepean street. Architect, A. L. Weeks, 75 Sparks street. General contractors, Fairley & Cosgrove, 562 Rideau Hall in connection with church.

Addition to Citadel No. 1, cost $7,000, Slater, for Salvation Army. Architect, Major Miller, Toronto. General contractors, McDermott & Tyndall, 243 Flora.

Peterboro, Ont.

Incinerator planned by City Council. Chairman, Board of Works, Wm. Buller. Engineer, R. H. Parsons. General contractors, the A. H. Reid Incinerator Co., Toronto. To be erected on north side of Townsend street between Aylmer and George streets.

Regina, Sask.

Addition to general hospital, cost $88,-107. Clerk, A. W. Pool. Architect, N.

R. Darrach. General contractor, R. J. Lecky Co., Ltd., Northern Crown Bank Bldg. Four storeys, brick and stone construction, brick and concrete foundation.

Revelstoke, B.C.
School, cost $44,000, planned by the Board of Education. General contractor, O. W. Abrahamson.

Stratford, Ont.
Fair Bldg., cost $10,000, Britannia, for North Perth Agricultural Society. Secretary, Jas. Stewart, Downie street. Architect, T. Hepburn, Downie street. General contractor, W. Bradshaw, Water St. Main Building, 80 x 80, grandstand 70 ft. frontage, steel construction, seating capacity 600. Foundations in.

St. John, N.B.
Post office planned by Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Architect, G. E. Fairweather, 13 Germain street. General contractors, Rhodes Currey Co., Amherst, N.S. Steel work will start in about two weeks. Foundation will not be put in until spring.

St. Thomas, Ont.
Interior fittings for post office. General contractors, Hall & Dollery Electrical Co., 848½ College street, Toronto. Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa.

Sudbury, Ont.
Public building, cost $98,200, planned by Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractors, Doran & Devlin, Eastern Block, Ottawa.

Toronto, Ont.
Market building, St. Patricks, planned by Board of Control. Mayor, H. C. Hocken. General contractors, Teagle & Son, 55 Boswell avenue.

Abattoir equipment, cost $108,376, required by Board of Control. Mayor, H. C. Hocken. General contractors, W. R. Perrin & Co., 530 King St. E.

Winnipeg, Man.
Church, Qu'Appelle street, for Knox Presbyterians. Pastor, Rev. Dr. F. P. DuVal. Architect, J. H. G. Russell, 1110 McArthur Bldg. General contractors, J. McDiarmid Co., Ltd., Canada Bldg. Foundations and retaining wall will be completed this year, the remainder next.

School for Rural Municipality of St. Vital. Secretary-treas., Jno. Edmond, Grand Vital. Architects, Hooper & Davis, Confederation Life Bldg., Winnipeg. General contractors, Modern Construction Co., Sterling Bank Bldg., Winnipeg. By-law passed authorizing municipality to start with work. Two stys., 40 x 60. Excavating started.

Fire station, cost $43,780, planned by Board of Control. Secretary, M. Peterson. Engineer, H. N. Ruttan, 223 James ave. General contractors, Willoughby Kelso Company.

Theatre, Market street, owned by Patterson & Cass, Canada Bldg. Architect, G. W. Northwood, Northern Crown Bank Bldg. General contractors, masonry, carpentry and plastering, J. McDermott & Co., Canada Bldg. Steel, C. C. P. Turner Co., Canada Bldg. Electrical work, Cowan & Levy, Portage ave. Terra cotta, T. Gross, Electric Railway Chambers. Painting, heating, plumbing and interior fittings not yet let.

Woodstock, N.B.
Library and Agricultural School planned by Estate of L. P. Fisher. Trustee, Allison B. Connell, Woodstock. Architect, G. E. Fairweather, 13 Germain St., St. John. General contractor, J. Fred Ryan, Fredericton, N.B.

Business Buildings and Industial Plants

Berwick, N.S.
Office building, cost $5,000, for United Fruit Co. Manager, S. B. Chute. Two storeys, brick construction. Plans in progress.

Cedar Springs, Ont.
Warehouse, cost $7,000, contemplated for J. S. McGingan. Architect not yet chosen. To be used for storage and manufacturing of tobacco. Fireproof construction, corrugated iron or asbestos roofing.

Clayburn, B.C.
A. F. McLaren, c/o McLaren Cheese Co., Toronto, plans to erect ten milk factories in the Province of British Columbia, the first one to be at Clayburn.

East Oakland, Ont.
Cattle and implement buildings, cost $5,000, for Wm. Harkness, West River Road, Galt P.O. Fireproof construction, concrete and stone foundation. Plans in progress.

Kelvin, Ont.
Cattle building, cost $3,000, for Jacob Roswell. Fireproof construction, stone and concrete foundation. Plans in progress.

London, Ont.
Factory, cost $15,000, planned for Battle Creek Toasted Corn Flakes Co., Ltd. President, A. A. Campbell. Architect not yet chosen. Company will add one and possibly two new buildings to plant.

Montreal, Que.
Addition to glove and leather factory contemplated by F. Galibert, 580 Parthenaia street. Plans in progress.

Fire alarm factory, cost $100,000, contemplated for the Argus Fire Alarm Co., Ltd., 54 Notre Dame E. Architect not yet chosen. Officers: Alex Guenette, Lachine; Anslem Guenette, St. Jerome; L. Cadieux de Courville, 94 Pontiac street; J. E. Moranville, 54 Notre Dame East; Henri Guenette, 54 Notre Dame East.

Repairs to warehouse, cost $15,000, planned for Caverhill, Learmont & Co., 89 St. Peter street. Elevator shaft, roof, interior woodwork and plaster badly damaged recently by fire and water. Will repair at once.

Grain elevator contemplated by the Canadian Producing Co., 950 Rivard St. Plans in progress.

Medicine Hat, Alta.
Factory planned for Western Canada Threshing Machine Co., Ltd. President, J. E. Davis. By-law providing site, concessions, etc., will be submitted in return for which company will erect large factory for the manufacture of farm implements.

Nanaimo, B.C.
Hotel building planned by A. Henderson, Globe Hotel. Architect, Alex. Forrester, Wentworth. Three storeys, brick, concrete foundation, cement floors, pool room. Tenders will be called.

Ottawa, Ont.
Factory, Aberdeen, contemplated by M. J. O'Brien, Raglan St., Renfrew, for the manufacture of mining tools, equipment, etc. Concrete foundation, solid brick construction. Plans in progress.

Point Edward, Ont.
Grain elevator contemplated for Grand Trunk Railway. Concrete and steel construction. Plans in progress.

Regina, Sask.
Boot and shoe factory, cost $55,000, contemplated for W. G. Downing Co., Ltd. Architects, Storey & Van Egmond, Credit Foncier Bldg. Brick and stone construction, brick foundation, electric lighting, machinery (shoe), cost $15,000. Plans in progress.

Sombra Twp., Ont.
Farm buildings, cost $3,500, for Geo. Catton, Con. 8, Sombra, Courtright P.O. Fireproof construction, stone foundation, corrugated iron or asbestos roofing. Plans in progress.

Summerland, B.C.
Hotel for Roe Bros. 60 x 60, pool room, 12 sleeping apartments. Plans in progress.

Tilbury, Ont.
Plant, cost $20,000, contemplated by Canadian Auto Top Co. Architect to be selected. Two storeys, white brick construction.

Wilberforce, Ont.
Tonkin-du-Pont Graphite Co. has been incorporated to build and operate mills for refining of graphite, etc. Capital $125,000. Secretary, H. G. Tonkin.

CONTRACTS AWARDED

Calgary, Alta.
Stores, cost $4,000, Mt. Pleasant, for R. McMann, 1010 5th St. N. E. Builder, R. Patterson, 4th ave. N.W. Two stys., 22 x 45, frame and brick construction. Excavating done.

Warehouse, cost $4,000, Industrial Heights, for Ogilvie Flour Mills, Ltd., Medicine Hat. General contractor, R. O. Benell, General Delivery. One storey, 30 x 140, frame construction. Excavating started.

Fort Erie, Ont.
Garage, cost $4,000, Niagara street, for Mrs. H. T. Sewell. General contractors and architects, Troupe Bros. Masonry, A. D. Nie. One storey, 50 x 60, artificial stone construction, cement foundation. Excavating started.

Halifax, N.S.
Foundry, cost $9,350, Campbell Rd., for Hillis & Son, Ltd., Campbell Road. General contractor, E. J. Horne, 255 Agricola street. Two storeys, 90 x 44, cement foundation, reinforced concrete construction, felt and gravel roofing.

Hamilton, Ont.
Cattle byres, cost $10,000, Terra Cotta ave., for the Harris Abattoir Co., Ltd., Strathcona ave., Toronto. Plans ready. Work being done by owners.

Additions and alterations to restaurant cost $3,000, King street, for H. L.

[illegible] Toronto. General contractor, Samuel Howard, Mary Street. White enamel brick, tile floors, store front, billiard room, brick bakery in rear.

Foundry and storage warehouse, Clark street, for Otis-Fensom Elevator Company, Victoria ave. north. Architects, Stewart & Witton, H. P. & L. Bldg. Mason, W. H. Cooper, 67 York street. Two storeys and basement, 200 x 45, 100 x 70.

Alterations and addition to store, cost $15,000, James St. N., for M. & S. Epstein, Dom. House Furnishing Co., 120 James St. N. Architect, W. A. Edwards, 7 Hughson St. S. General contractors, Geo. E. Mills, King St. E. Three stys., 70 x 100.

Store, cost $2,500. Owner and builder, E. B. Ratcliffe, 534 Main St. Concrete foundation. Permit issued.

Indian Head ,Sask.

Grain warehouse, cost $15,000, for Angus MacKay Farm Seed Co. General contractor, A. B. Hamilton, Eden street.

Kentville, N.S.

Store and residence, cost $5,000, for Jno. Redden. Work done by day labor. Two storeys, brick veneer construction. Store fixtures required. Foundations in.

McAdam Jct., N.B.

Machine Shop, cost $45,000, for C.P.R. Engineer, Geo. Wetmore, King St., St. John. General contractor, Hy. Post, Woodstock, N.B. Concrete addition will also be asked, 25 x 40.

Montreal, Que.

Alterations and addition to store, cost $3,000, St. Catherine W., for Guarantee Pure Milk Co., 675 St. Catherine W. Architects, Hutchison, Wood & Miller, 50 Royal Insurance Bldg. General contractor, Reid, McGregor & Reid, 14 Guy Block. Heating and plumbing, Jno. A. Gordon, 301 St. Antoine.

Addition and alterations to three stores and three flats, cost $10,000, Bleury. Builder and general contractor, J. E. Wilder, 41 Mayor. Work to be done by day labor. One storey, 40 x 60, cement foundation, reinforced and brick constr. Foundations started.

Office, etc., cost $1,800,000, St. Patrick, for Imperial Wire & Cable Co., 241 Guy street. Architect, W. J. Carmichael, Bell Telephone Bldg. General contractor, E. G. M. Cape, New Birks Bldg. Steel, Dom. Bridge Co., Lachine.

Warehouse, O'Connell. Owners and general contractors, the Grasselli Chemical Co., 102 Nazareth street. Architects, Grasselli Chemical Co., Ottawa Street, Hamilton, Ont. One storey, 61 x 120, cement foundation, brick construction, felt and gravel roofing.

Lumber mill, cost $25,000, 400 William street, for F. Tremblay & Co., 400 William street. Owner will purchase all materials for erection of new building. Some machinery required. Two storeys, brick veneer construction. Work done by day labor.

Steel works, cost $1,000,000, Longueuil, for Sir W. S. Armstrong, Whitworth & Co., Ltd., c/o M. J. Butler, 22 Victoria Sq., Montreal. General contractor, E. G. M. Cape, New Birks Bldg. Mill work, Pringle & Co., Ltd., Belleville, Ont. Roofing and sheet metal, the Metal Shingle & Siding Co., 91½ Delorimier ave. Excavating started.

Greenhouse and conservatory, cost $25,000, for L. H. Timmins, Dom. Express Bldg. Architects, E. & W. S. Maxwell, 6 Beaver Hall Sq. General contractors, Reid, McGregor & Reid, Guy Block, St. Cathcart W. Stone foundation and construction. Excavating started.

Structural steel works, cost $3,300. General contractors, International Marine Signal Co., Ltd., Albert and Wellington streets, for furnishing and erecting of 11 steel trusses for buildings at low level pumping station, Atwater ave.

Factory, cost $50,000, 1604 Clarke, for L. H. Timmins, Dom. Express Building. General contractors, Atlas Construction Co., 37 Belmont. Painting and glazing, E. Gross, 98 Inspector. Four storeys, 100 x 100.

Office, etc., cost $11,800, St. Patrick, for Imperial Wire & Cable Co., 541 Guy street. Architect, W. J. Carmichael, Bell Telephone Bldg. General contractor, E. G. M. Cape, New Birks Bldg. Steel, Dominion Bridge Co., Lachine.

Merchants Bank, cost $25,000, St. Zotique, head office 205 St. James street. Architects, Hogle & Davis, 30 St. Francois Xavier. General contractors, Jno. Stewart & Co., Bethune street. Sub tenders will be received shortly by general contractor. Two storeys and basement, 44 x 41.

Garage, cost $4,000, for Bank of Montreal, 109 St. James street, Montreal. Architects, Peden & McLaren, 20 St. Alexis street. General contractors, Reid, McGregor & Reid, Guy Block. Electrical work, Geo. Charwin, 226 Iberville.

Bank building, cost $4,000, St. Lambert, for Royal Bank, 147 St. James. Architect, K. G. Rea, 54a Beaver Hall Hill. General contractor, Wm. Irving, Guy Block. Two storeys, 25 x 40, cement foundation, brick construction.

Ottawa, Ont.

Addition to office for Metropolitan Life Insurance Co., Queen street. General contractor, Alex. Christie, Elgin street. Brick construction.

Quebec, Que.

Woodworking factory, Limoilou, 10th ave., planned for E. T. Nesbitt, 18 Queen street. All work done by day labor. Machinery required.

Regina, Sask.

Office building, cost $15,000, Scarth, for Canadian Financial Corporation. General contractor, H. Black, new Black Block. Two storeys, brick construction, brick and concrete foundation. Foundations in.

Toronto, Ont.

Warehouse, cost $30,000, St. Nicholas street, for M. Rawlinson, Ltd., 612 Yonge street. General contractor, R. Robertson, Confederation Life Bldg. Brick construction and foundation, felt and gravel roofing.

Vonda, Sask.

Cold storage warehouse planned by Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractor, Henry Garvin.

Windsor, Ont.

Store and flats, cost $8,000, Gladstone, for Fred Laforet. General contractor, H. Howe. Two storeys, brick construction and foundation.

Store, cost $5,000, Pitt. Owner and builders, T. W. Brooke & Son, 7 Pitt St. W. Two storeys, 20 x 65, brick construction, cement foundation.

Winnipeg, Man.

Addition to stables, cost $50,000, for Canada Bread Co., Portage ave. and Barnell. General contractors, Grey & Davidson, Wall and Portage streets.

Alterations to office building, Portage ave., for Mrs. J. V. Chalmers, 57 Carlton street. Architects, Jas. Chisholm & Sons, Enderton Bldg. General contractors, Fred Lewis Co., Somerset Bldg. Five storeys, 20 x 30, concrete foundation, brick construction. Canada Furniture Co., Builders' Exchange, are making the alterations and will occupy the building when completed.

The contract for the solid bronze grille work and cages for the new addition to the Bank of Ottawa, Winnipeg, Man., has been awarded to the Geo. B. Meadows Wire Iron & Brass Works Co., Ltd., Toronto. Geo. Northwood, architect.

Woodstock, Ont.

Warehouse for Geo. E. Barbour Co., Ltd., North Market Wharf, St. John. Architect, F. Neil Brodie, 42 Princess St. General contractor, Fred Ryan, Fredericton, N.B. 1½ storeys, 40 x 80. Foundations in.

Residences

Montreal, Que.

Ten flats, cost $5,000. Owner and builder, Alderic Jolinqolieur, 2764 Diolet. General contractor will call private tenders. Three storeys, 30 x 50, concrete foundation, brick construction.

Residence, cost $10,000, Outremont (Outremont), for G. N. Clarmont & Co., 97 St. James street, Montreal. Architect, J. A. Ouellette, 250 Amherst street, Montreal. Two storeys, 44 x 42, stone foundation, brick construction. Plans drawn.

Twelve flats, cost $12,000, De Villiers. Architect and builder, Russell Aubertin, 44 Blvd. Monk. Tenders received by owner for masonry, heating and plumbing. Other work done by day labor. 3-storeys, 75 x 40, concrete foundation, Montreal stone construction, felt and gravel roofing.

Ottawa, Ont.

Residence, cost $6,500, Daly ave., for T. A. Armstrong, 384 Wellington street Architect, F. C. Sullivan, Castle Bldg., Queen street. 2½ storeys, brick construction, stone foundation. Plans drawn.

Residence, cost $6,500, Daly avenue, for Mrs. Catherine Whelans, c/o architect, F. C. Sullivan, Castle Bldg. Queen street. 2½ storeys, brick construction, stone foundation. Plans drawn.

Regina, Sask.

Residence, cost $5,000, Garnet. Owner and general contractor, F. Bruce, Garnet Street. 2½ storeys, brick construction, concrete foundation. Foundations in.

Toronto, Ont.

Three residences, cost $15,000, High Park ave. Owner and general contractor, S. Solodinsky, 2122 Dundas street., will receive tenders. 2½ storeys, brick construction and foundation.

Four detached residences, cost $16,000, Lauder ave., for Dr. F. A. Sellery, 530 Bloor west. 2½ storeys, 17 x 42, brbick construction, stone foundation. Plans drawn.

Forty-eight residences, cost $2,000 to $2,500 each, Sandown Park Estate, stop 33, Kingston Road, contemplated by A. Gordon, c/o Toronto Canadian Land Ltd., 41 Adelaide E. Brick construction, stone foundation. Company capitalized at $48,000. Building to commence in fall. Grading, sidewalks, etc., about completed.

One detached residence, cost $5,000, St. Leonard ave., planned for J. H. Galloway, 23 Toronto street. Tenders received by owner. Two storeys, 30 x 38, brick construction and foundation.

Victoria, B.C.

Apartments, cost $12,000, Superior St., for Thomas & Dawson. Architects, Jesse M. Warren, 503 Central Building. Plans ready.

Winnipeg, Man.

Three residences, cost $4,000 each, Sherburn. Architect and general contractor, R. Robson, 284 Simcoe street. Frame, concrete foundation. Excavating started.

Residence, cost $5,000, Sherburn, Architect and general contractor, R. Robson, 284 Simcoe street. Two storeys, frame, concrete foundation. Excavating started.

Residence, cost $5,000, Sherburn. Architect and general contractor, E. F. King, Suite H. Amulet Apartments. 2½ storeys, frame, concrete foundation. Excavating started.

CONTRACTS AWARDED

Edmonton, Alta.

Residence, cost $10,000, Connaught, for E. C. Pardee, 1543 Victoria ave. General contractor, G. T. Clyde, 2215 Jasper ave. east. Two storeys, 42 x 48, frame construction, cement foundation. Excavating started.

Hamilton, Ont.

Residence, cost $25,000, Queen street, for J. W. Lamereaux, 26 Canada street. General contractor, W. H. Yeates, Jr., 24 Leeming street. Roofing, Wm. Findlay, 317 Aberdeen ave. Plastering, Chapman & Son, 69 Hughson street north. Carpentry, Murray & Connor, 230 Locke St. S. Electrical work, Culley & Breay, King street. Plumbing, Adam Clark, 7 Main street.

London, Ont.

Residence, cost $6,000, Sherwood ave., for John Gunn, c/o McClary Mfg. Co., Architect, John M. Moore, 442½ Richmond street. General contractor, John Putherbough, 1002 Wellington street. 2-storeys, 26 x 38, pressed brick construction.

Residence, cost $7,000, for S. A. Manness, 745 Waterloo street. Architect, W. G. Murray, Dom. Savings Bldg. General contractor, W. Trott. 2½ storeys, 32 x 36, white brick construction, stone and concrete foundation. Excavating done.

Medicine Hat, Alta.

Residence, cost $9,000, Roberts street, for A. C. Patterson. Architect, A. Redden, 331 Queen street. 2½ storeys, 40 x 52, brick construction, cement foundation. Plans ready. Excavating started.

Montreal, Que.

Alterations to Astoria Apartments, cost $5,000. Architects, MacVicar & Heriot, 104 Union ave. General contractor, Wm. Irving, Guy Block. Changing foundation work and small alterations, stone and concrete foundation.

Alterations and addition to residence, cost $17,500, 74-76 McTavish, for Henry H. Lyman, c/o Lymans, Ltd., 474 St. Paul street. Architects, MacVicar & Heriot, 104 Union ave. Masonry, Jno. Stewart & Co., Bethune street. Roofing, Richardson, Simard & Co., 745 Clarke. Plastering, W. S. Cook, 11 Concord. Marble and tile, Jas. Walker, Hardware Co., 252 St. James. Stone and concrete foundation, brick construction. Excavating started.

One detached residence, cost $5,000, Brock, for A. Kennedy, Westminster ave. Architects, Benois & Girard, Dom. Bank, cor. St. Catherine and Bueury streets. General contractors, Montreal West Realty Construction Co., 130 Westminster ave. Heating and plumbing, P. L. Binns, Montreal West. Carpentry, iron and steel, roofing, painting and electrical work, general contractor. Two storeys, 25 x 50, cement foundation, veneer and brick construction.

Nine flats, cost $8,000, Chabot. Owners and general contractors, Cordeau & Cordeau, 1896B Christophe Columbe. Architect, E. Cordeau, 1896B Christophe Columbe. Three storeys, 50 x 21, cement foundation, brick construction. Excavating started.

Three flats, cost $8,000, St. Hubert, for L. Clement, 30 Christophe Columbe. Architect and general contractor, owner. Masonry, O. Martineau, 371 Marie Anne E. All other work done by day labor. Three storeys, 25 x 70, cement, stone foundation, Montreal stone construction.

Three residences, cost $22,000, Outremont, Bloomfield, for A. Corbin, 1149 Van Horne ave. Architects, Vian & Venne, 76 St. Gabriel, Montreal. General contractor, masonry, carpentry, plastering and painting, owner. Roofing, heating and plumbing, Jos. St. Amand, 109 Laurier ave. west. Electrical work, Martel & Frere, Bernard street. Three storeys, 20 x 77.

Residence, cost $12,000, Cedar avenue, for C. B. Robin, 16 The Marlborough. Architects, Saxe & Archibald, 59 Beaver Hall Hill. Masonry, Murray & McRithie, Coristine Bldg. Carpentry, A. K. Hutchison, 4404 St. Catherine W. Plastering, McNulty Bros., 181 Mountain. Painting and glazing, Alex. Craig, 41 Jurors. Heating and plumbing, McKnight & Blackader, 91 Inspector. Electrical work, Archibald & Brotherhood, Herald Bldg.

Addition to five flats, cost $9,000, Park ave., for the Alpha Raffa Kappa Fraternity. Architects, Hutchison, Wood & Miller, 50 Royal Insurance Bldg. General contractor, Z. Beaudry, 2420 Hutchison street. Four storeys, 44 x 18, addition brick, concrete foundation. Work started.

Ottawa, Ont.

Residence, cost $6,000, Rockwood, for Dr. W. Gatoury, c/o architect, F. C. Sullivan, Castle Bldg., Queen street. All work being done by day labor, under supervision of architect. Excavating started.

Residence, cost $10,000, Powell, for Mr. Quinn, c/o architect, F. C. Sullivan, Castle Bldg., Queen street. General contractor, T. A. Shore, 41 Chamberlain St. Three storeys.

Quebec, Que.

Residence, cost $11,000, Limoilou, for J. & Thos. Lamontagne, St. Nicholas. General contractor, J. Lamontagne, St. Nicholas. Steel, Eastern Canada Steel & Iron Works, St. Malo. Other contracts not yet awarded. Three storeys, 100 x 90, stone foundation, Scotch brick construction.

Regina, Sask.

Curran Bros., Scarth street, will erect fifty residences in Eastern Annex.

Residence, cost $6,000, 16th ave. Architect and general contractor, A. W. McGregor, Darke Block. Frame and brick construction, concrete and brick foundation. Foundations in.

Residence, cost $7,000, Athol street, for D. T. McConnell. General contractor, W. G. Dand, 1826 Scarth street. 2½ storeys, brick construction. Foundations in.

Apartments, cost $25,000, Dowling. Architect and general contractor, A. W. McGregor, Darke Block. Stone and brick construction, concrete and brick foundation. Excavating started.

Residence, cost $6,000, Scarth Street, for D. T. McConnell. General contractor, W. G. Dand, 1826 Scarth street. 2½ storeys, brick construction. Foundations in.

St. John, N.B.

Bungalow, cost $6,000, for W. P. Queen, Canada Life Bldg., Prince William street. General contractor, R. A. Corbet, Douglas ave.

Toronto, Ont.

Residence, cost $8,000, for Rev. A. McCaffrey, Port Credit. Architect & general contractors, Jno. Miller & Son, Port Credit. Two storeys, 37 x 31, brick construction. Foundations in.

Walkerville, Ont.

Residence, cost $6,000, Devonshire, for F. C. Thrall, c/o Wilt Twist Drill Co. Architect, R. H. Marr, 1529 Ford Bldg., Detroit, Mich. Mason, Geo. Goodman, 191 Goyeau St., Windsor. Iron and steel, Tom Eansor, Pitt St. Two storeys, 30 x 30.

Power Plants, Electricity and Telephones

Dorval, Que.

The Town of Dorval has applied to Lachine Council to supply them with electric power if they install lighting system. Request referred to Light Committee. Sec.-Treas., Alph. Decary Quebec Bank Bldg., Montreal.

Elora, Ont.

Hydro-electric power system planned. Clerk, Henry Clarke. Meeting to discuss problem will be held August 28th.

Fergus, Ont.

Hydro-electric power contemplated by Village Council. Clerk, James Beattie. Meeting to discuss problem will be held August 28th.

Montreal South, Que.

The Board of Trade are taking active

(Continued on page 76)

Tenders and For Sale Department

Bridge Tenders

Sealed tenders will be received by C. E. Willoughby, Island Grove, Ont., up to September 2nd for the construction of an 82-ft. 6-in. steel bridge with concrete abutments for the Twp. of North Gwillimbury, about 2½ miles from Sutton. For plans and other information apply to Mr. Willoughby or to

BOWMAN & CONNOR, Engineers,
35 36 Toronto St., Toronto, Ont.

TENDERS

Whole or sepatare tenders will be received up to 12 o'clock noon, of **Tuesday, September 2nd,** for the several trades in connection with the erection of a Carnegie Free Library at Dresden.

Plans and specifications may be seen at the office of the architect, W. A. Mahoney, Guelph, or at the Library Building Dresden.

Lowest or any tender not necessarily accepted.

THOMAS CONVAY,
35 Secretary.

Sealed tenders addressed to the undersigned and endorsed "Tender for Jetty and Dredging at the North Arm of the Fraser River, B.C.., will be received at this office until 4.00 p.m., on **Tuesday, September 30, 1913**, for the construction of Jetty and Dredging at the North Arm of the Fraser River, B.C.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department and at the offices of C. C. Worsfold, Esq., District Engineer, New Westminster, B.C.; W. Z. Earle, Esq., District Engineer, Winnipeg, Man.; J. S. MacLachlan, Esq., District Engineer, Victoria, B.C.; J. L. Michaud, Esq., District Engineer, Post Office Building, Montreal, P.Q.; J. G. Sing, Esq., District Engineer, Confederation Life Building, Toronto, Ont., and on application to the Postmaster at Vancouver, B.C.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to five per cent. (5 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.
Department of Public Works,
Ottawa, August 18, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—45074. 34-35

CITY OF KINGSTON

Tenders for Pavements

Sealed tenders will be received by the undersigned up to 3 o'clock p.m., **Friday, September 5th, 1913,** for the construction of approximately 4,250 square yards of Asphalt Block Pavement, 1,330 lineal feet of Concrete Curb and Gutter, 1,040 lineal feet of Concrete Gutter and 2,000 square feet of Concrete Walk. (widening walk).

Plans and specifications may be seen and all other information obtained at the office of the undersigned.

A marked cheque for five per cent. of the amount of the tender must accompany each bid.

The lowest or any tender not necessarily accepted.

R. J. McCLELLAND,
City Engineer.
City Buildings,
Kingston, Ont., Aug. 26, 1913 35

Notice to Contractors

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on **Tuesday, September 2nd, 1913,** for the construction of the following sewers:—

Turner Rd. from Davenport Rd. to Tyrell Ave.
Kingston Rd. from Main St. to Victoria Park Ave.
Conrad Ave., from Hillcrest Drive to Tyrell Ave.
Orchard Park Ave. from Queen St. to North End.
Frichot St., from Yonge St. to E.S. McMurrich St.
Frank Crescent, from Hillcrest Drive to Bracondale Hill Road.
Hillcrest Drive, from Christie St. to Tyrell Ave.
St. Mathias Place, from Claremont Street to Bellwoods Ave.
Lane first north Bloor St., from Euclid Ave. to Manning Ave.
Lane first south Adelaide St., from Charlotte St. to Lane first west Peter Street.
Lane first south Humberside Ave., from Keele St. to 144 ft. East.
Lane first west Euclid Ave., from Lane first north Bloor Street to London Street.
Lane first north King St., from Charlotte St. to the east end.
Lane first west Sherbourne St., from Duchess St. to 142 feet south.
Lane first north St. James Ave., from Rose Ave. to Parliament Street.
Midway Drainage System, viz., Felstead, Lamb and Danforth Aves.
Divisions No. 1 and 2, West Toronto, Bloor St.
Lane first west Peter street, from Adelaide St. to lane first west of King Street.
Lane first west Berkeley St., from lane first north Wilton to lane first south Gerrard St.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications may be seen and forms of tender obtained at the office of the Commissioner of Works, Toronto.

Tenderers shall submit with their tender, the names of two sureties (approved by the City Treasurer, not members of the City Council, or officers of the Corporation of the City of Toronto) or in lieu of said sureties, the bond of a Guarantee Company approved of as aforesaid.

The usual conditions relating to tendering as prescribed by the City By-law must be strictly complied with.

The lowest or any tender not necessarily accepted.

H. C. HOCKEN, Mayor,
Chairman, Board of Control.
Toronto, Aug. 20, 1913. 35

Tenders for Concrete Bridge

Tenders marked "Tender for Bridge," addressed to the County Clerk, Lindsay, Ont., will be received until **Saturday, August 30, 1913,** for the erection and completion of a reinforced Concrete Bridge and relative work across the Narrows of Mud Lake in the Township of Carden in the County of Victoria, according to plans and specifications prepared by Mr. George Smith, County Engineer, all to be finished not later than November 1st next.

The steel for reinforcement will be purchased and supplied by the Municipalities interested and at their expense, tenders will not, therefore, include a price for that material.

Plans and specifications may be seen at the office of the County Clerk, Court House, Lindsay, or copies supplied on application, on and after Wednesday, August 20th, 1913.

The lowest or any tender not necessarily accepted.

A. E. BOTTUM,
Chairman of Committee.
Lindsay, Aug. 16th, 1913. 34-35

Tenders Wanted

Sealed tenders will be received up to noon on the **16th day of September, 1913,** by the undersigned at Cayuga, Ontario, for the construction of twenty-six and one-half miles of stone macadam road in the County of Haldimand.

The work will be let in three separate and distinct contracts, not necessarily to the same individual.

Tenderers are required to examine the localities of the work and are required to be present at the opening of the tenders at 2 p.m. on Wednesday, the 17th day of September, 1913.

Plans and specifications may be seen at the office of the County Engineers, Messrs. Jackson & Kyd, Dunnville, or may be had from them on the payment of $10, which sum will be refunded on return of the documents.

Lowest or any tender not necessarily accepted.

T. A. SNIDER, K.C., County Clerk,
County of Haldimand,
32-37 Cayuga, Ont.

Special Notice

Every man who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works are advertised.

Send along your plans when asking for tenders put a line in your advertisement to that effect.

No extra charge is made for filing plans at one or all four offices.

Contract Record and Engineering Review

Montreal—119 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—429 Pender Street.

Tenders Wanted

Sealed tenders (marked tender for heating), and addressed to the undersigned will be received up to **Thursday, September 4th**, at 12 o'clock noon, for Heating and Ventilating a four room School Building at Beachville, Ont.

Plans, specifications, etc., may be had at the office of the Architect, Woodstock, Ontario.

B. McNICHOL, Architect.
Woodstock, Aug. 24th, 1913. 35

Town of Neepawa, Manitoba

Tenders for Machinery

Sealed tenders will be received up to noon, **September 1st, 1913**, for machinery for additions to the power plant at Neepawa, as follows:—

Specification Section No. 1—Two 72-in. x 18-ft. Boilers.

Specification Section No. 2—One 187½ h.p. Engine.

Specification Section No. 3—One 150 k.v.a. Generator, Switchboard, etc.

Specifications may be seen at the offices of the Electrical News, or obtained from W. F. Skinner, Limited, 204 Sterling Bank Bldg., Winnipeg, or from the undersigned:

J. W. BRADLEY, Sec.-Treas.,
35 Neepawa, Man.

CITY OF LONDON

Tenders for Steelwork

Sealed Proposals addressed to the "Chairman and Members No. 2 Committee" will be received at the office of the City Clerk up to 5 p.m. on **Thursday, the 11th day of September, 1913**, for the supply and erection of three 130 feet spans rivetted truss steel highway bridge over the River Thames, the substructure for which is already under construction.

Plans, specifications and all particulars can be had at the office of the City Engineer.

No tenders will be considered unless accompanied by a deposit cheque for 5 per cent. amount of the bid.

The lowest or any tender not necessarily accepted.

B. W. BENNETT, Chairman No. 2 Committee.
WM. N. ASHPLANT, City Engineer. 34-35

AGENTS WANTED

High Class Artificial Stone Company requires agents in every city to sell building stone, ornamental work, pipes, roof and floor tiles, etc. Liberal commission allowed. Address C. P., c/o "Contract Record," Toronto. 35-36-37

Some Good Machines

Buckeye Trenching Machine, 12 in. x 4½ ft, AI ... $700
Buckeye Trenching Machine, 27 in. x 8 ft.; just through shops; as good as new ... $2,500
Parsons Trenching Machine, 2 ft. x 5 ft. to 20 ft. deep. A1 ... $3,500
Thew No. 0 Steam Shovel. Overhauled by Thew Manufacturers last year. A1 ... $2,800

TRACTION ENGINE
Located in Canada, 30 H.P.

undermounted, double Avery machine, coal burner with rear mounted Steel Water Tank. Also an Avery Steel Water Tank on truck with pump. Cost, new, $3,575. This is in first-class condition ... $1,800

WHAT DO YOU NEED IN SECOND-HAND EQUIPMENT?
TRY US!
WILLIS SHAW MACHINERY CO.
La Salle Street, Chicago. Ill.

Power Plants, Electricity and Telephones

(Continued from page 73)

steps to have an electric lighting system installed.

Montreal, Que.
Supt. of Lighting Department, Mr. Parent, will shortly call tenders for electric lighting, suitable for a conduit system of lighting. Possibly cluster lights. Enough required for several miles of streets. Board of Commissioners. Sec., L. N. Senecal.

Regina, Sask.
Power house equipment planned by City Commissioners. Coal bunkers, ash hoppers, coal and ash conveyors and crushers. Specifications at office of E. W. Bull, Supt. of Light and Power Department. Tenders received by Commissioners till noon October 1st.

St. Jerome, Que.
Improvements to electric lighting system, cost $23,500, planned. General contractors, The Maisonneuve Constr. Co., Maisonneuve, Que.

Souris, Man.
Lighting system, cost $40,000, planned by Town Council. Clerk, W. J. Breaky. By-law to be voted on on September 2.

Winnipeg, Man.
Tenders received by Board of Control till September 20th. Plans and specifications at office of Engineer, J. G. Glassco, 54 King St., for erection of duplicate transmission system on present right-of-way between Winnipeg and Point du Bois.

Miscellaneous

Athabasca Landing, Alta.
The Town Council contemplate purchasing a steam fire engine. Information from Town Clerk.

Ottawa, Ont.
Fire Chief Graham, City Hall, recommends the purchase of a motor driven steam fire engine. Fire Department. Supt., Controller Kent.

Toronto, Ont.
Chief Thompson recommends the expenditure of $100,000 for motor equipment to modernize Fire Dept. Board of Control. Mayor, H. C. Hocken.

Valleyfield, Que.
Fire alarm system planned by Town Council. Mayor, S. H. Ostiguy. General contractors, Sevigny & Lalonde, 115 Geo. Etienne Cartiei Square, Montreal.

Winnipeg, Man.
25,000 lbs. of weatherproof copper wire required by Board of Control. Sec., M. Peterson. Engineer, J. G. Glassco, 54 King St. General contractors, Canada Wire & Cable Co., 272 Main. $18.95 per 100 lbs.

Business Notes

Boute de L'Isle, Que.
Saw mill, owned by The McLaren Co., burned. Loss, $50,000. Will rebuild.

Bridgeburg, Ont.
Planing mill, owned by O. C. Teal, burned. Loss, $20,000. Partially covered by insurance.

Cobalt, Ont.
The Prospect Hotel, burned. Loss, $40,000. Building occupied by several firms, as follows:—Claud Morrison and R. C. Lowrey, tobocconists; Bank of Ottawa; F. J. Fenlan; Northern Ontario Light & Power Co.; Willis Abbott, stock broker; Frank McKay, tailor; Walter Bellsham, jeweller. Building completely destroyed by fire.

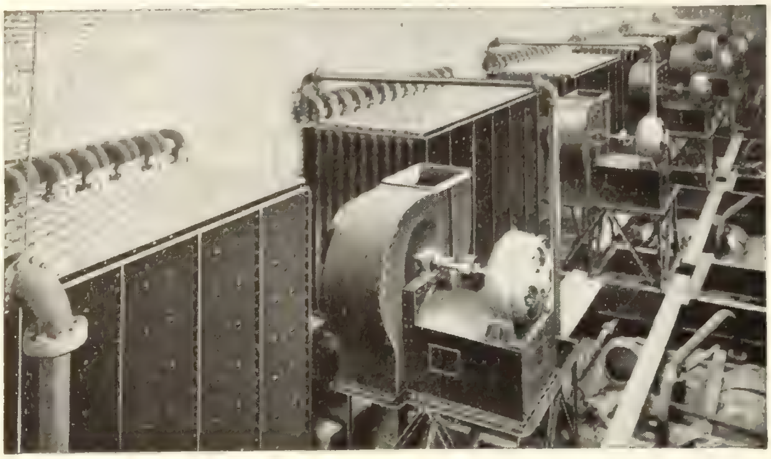
Harcourt, N.B.
Residences, burned. Owners, L. J. Watson, loss, $18,000; Miss B. Pride, loss, $3,000. Partly covered by insurance. Will rebuild.

Ottawa, Ont.
Planing mill, owned by H. F. Fraser, Bronson Ave., burned. Building valued at $10,000, and machinery at $10,000.

Second Hand
Model 41 Marion Steam Shovel
FOR SALE
At A Very Reasonable Figure

We have to offer for immediate delivery, subject to inspection and prior sale a Model 41 Marion Latest Type Steam Shovel, equipped with 1½ cubic yard dipper; on railroad trucks, complete. This shovel is not one year old and has been operated very little Shovel is in fine condition and is offered at a very low figure. Full details, prints and specifications sent on request.

Apply Box 862 Contract Record, Toronto, Ont.
34-35



At the Power Plant of The Denver Tramway Co.

are installed

6 Sturtevant (REG. U.S. PAT. OFF.) Metal-to-Metal Joint Economizers. *No Gaskets.* Capacity 300 lbs. Pressure.

6 Sturtevant (REG. U.S. PAT. OFF.) Multivane Induced Draft Fans direct connected to Electric Motors.

All working in connection with 6 Sterling Boilers 4200 B. H. P.

"Economical Fire Room Methods," by F. R. Low, Editor of Power; Sturtevant Bulletin No. 187-Z describes the operation and equipment of one of the most efficient and economical power plants in the world, The Wood Worsted Mills, Lawrence, Mass.; told in a most interesting manner by one of the foremost technical writers in this country. It is yours for the asking.

B. F. STURTEVANT CO. OF CANADA, Limited

GALT, ONTARIO

Office for Eastern Canada—**919 New Birks Building, Montreal**

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FILE YOUR PLANS

Free of charge at any of the four offices of the

"CONTRACT RECORD"

AND ENGINEERING REVIEW

Contractors and manufacturers of building, municipal, railway, and power plant equipment not only expect to see your tenders advertised in the "Tenders' Department" of the "Contract Record," but they will also find it a great convenience if you place your plans and specifications on file at any or all of our four offices, viz. Toronto, Montreal, Winnipeg and Vancouver.

Send along your next Tender Advt. together with Plans and Specifications

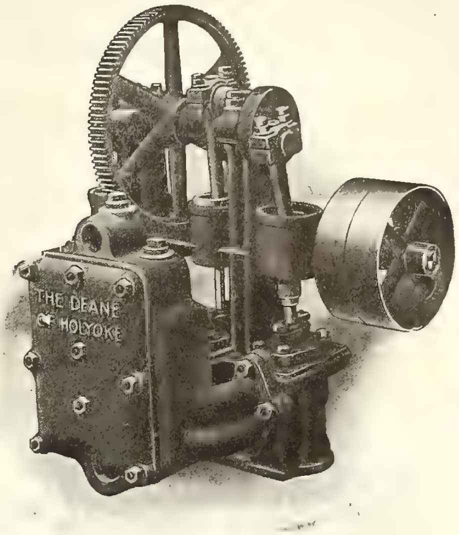
CONTRACT RECORD

AND ENGINEERING REVIEW

220 King St. West, TORONTO

MONTREAL	WINNIPEG	VANCOUVER
Board of Trade Building	Travellers Building	Hutchison Block

DEANE POWER PUMPS



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HOUSE SUPPLY

BOILER FEEDING

TANK SERVICE

THE JOHN McDOUGALL
CALEDONIAN IRON WORKS CO., LIMITED

Works: Seigneurs & William Sts., MONTREAL.

Manufacturers of Boilers, Castings, Condensers, Elevators, Engines, Filters, Forgings, Hydraulic Machinery, Pumps, centrifugal and reciprocating, Steam Turbines, Tanks, Water Wheels, Water Works Plants.

Tenders Wanted

should be advertised for in the "Tenders and For Sale Department" of the Contract Record and Engineering Review. This paper is the "Tender Ad." medium of Canada and always brings bids from the reliable contractors and supply houses.

File your plans for any work on which you are inviting bids, in our offices at Toronto, Montreal, Winnipeg or Vancouver.

ContractRecord
and Engineering Review
Toronto Ontario

PURE WATER

It is easy to obtain with our plants and apparatus

We design and contract for complete municipal filtration plants of any capacity.

We supply and install apparatus for sterilizing water supplies by the application of calcium hypochlorite.

Literature, Sketches, Estimates and Recommendations Supplied on Request

American Water Softener Co.
1001 Chestnut St., PHILADELPHIA, Pa.

We have no affiliations or working acquirements with any of our competitors.

BOILER AND STEEL PLATE WORK

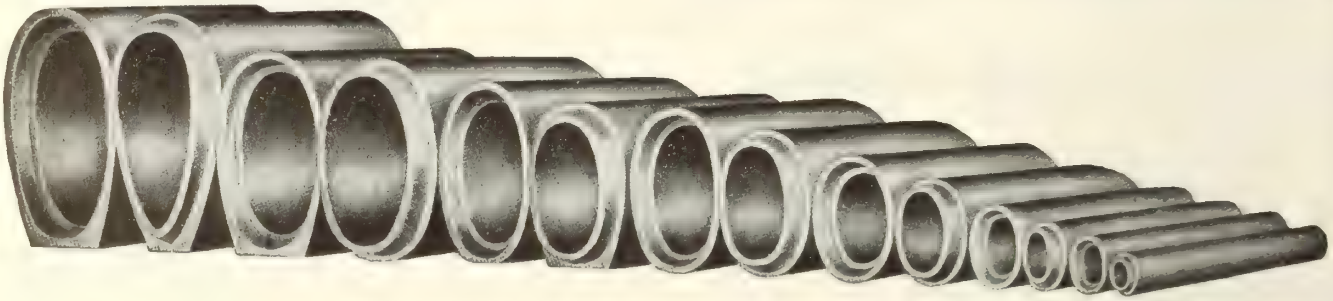
Of All Kinds

We are manufacturers of: Boilers, Steel Tanks, Smoke Stacks, Ore Buckets, Ore Cars, Steel Flumes, Etc. Any size or style.

Hoisting Machinery a Specialty

Let us quote on your requirements. *All Work Guaranteed.*

MARSH & HENTHORN, LTD., - Belleville, Ont.



Sewers and Culverts

properly built of properly made

- Reinforced Concrete Pipe -

LAST FOREVER.

OUR MATERIAL, SYSTEM and PRODUCT have been tested and approved by EMINENT ENGINEERS. NO RUST, NO ROT, NO FROST-BREAKS, NO PRESSURE-BREAKS, NO HIGH PRICES, NO DELAYS IN PROCURING, NO TROUBLE IN HANDLING.

STANDARD REINFORCEMENT, or SPECIAL if required. Stock sizes 6 in. to 60 in.

Patronize Experienced and Reputable Manufacturers.

Catalogue and prices on application.

Dominion Concrete Company Ltd.

Kemptville, Ontario

EQUIP YOUR CELLAR

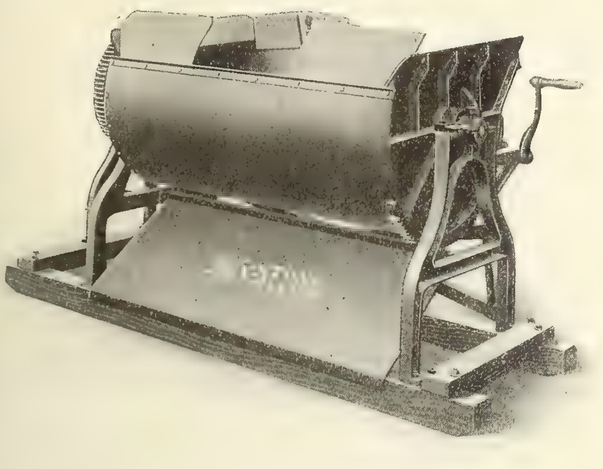
with one of our "Majestic" Coal Chutes which is the neatest and best equipment for any cellar. It is easily installed in either new or old houses. It permits coal, wood or vegetables to be put into the cellar without disfiguring the building in any way. And unlike a glass window it cannot be broken. The hopper can easily be removed if desired to put in very coarse coal or wood, or if a waggon chute is used. It swings back into the chute and allows the door to be closed. The door is made to lock when opened upward, and protects the wall or siding above the chute, and can be released only when closed. We make three standard sizes. There's a size that's just right for your cellar and your requirements. No. 1—22 x 16 x 13. No. 2—27 x 16 x 13. No. 3—33 x 22 x 18.

Send for our illustrated booklet, it shows and describes our full line of Coal Chutes

The Galt Stove & Furnace Co., Limited, GALT, ONT., CAN.

Toronto Representatives: Black Building Supply Co., Mail Building
Montreal Representative: E. F. Dartnell, No. 8 Beaver Hall Square
Gorman, Clancey & Grindley, Agents, Calgary and Edmonton, Alberta

Time Saved in Concrete Mixing



The Blystone Skid Mixer

Every movement of this mixer is calculated to save time. The mixing is quick and thorough and the dumping, worked by the handle on the right will save moments at every batch turned out. Strongly built—all working parts carefully balanced.

The Blystone Machinery Company
61 Railroad St., CAMBRIDGE SPRINGS, Pa., U.S.A.

Full line of Blystone Mixers carried in stock by
The A. R. Williams Machinery Co., Limited, Toronto, Ont.
N. J. Dinnen & Co., Limited, Winnipeg, Man.
Gorman, Clancy & Grindley, Calgary, Alberta.
Ritchie Contracting & Supply Co., Vancouver, B.C.

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"Hayes" Patent Steel Lath

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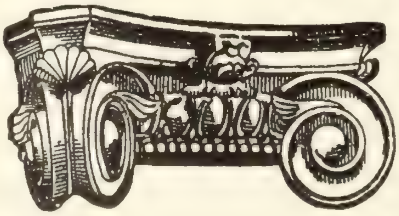

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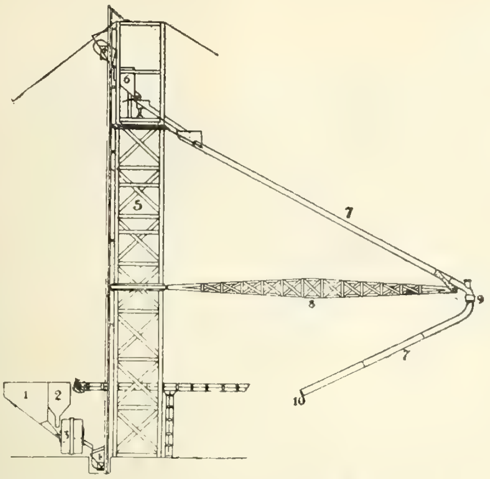

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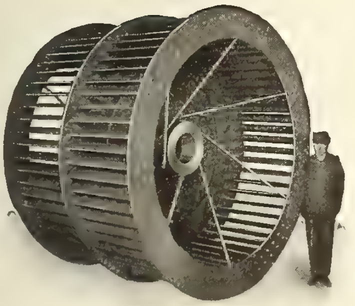

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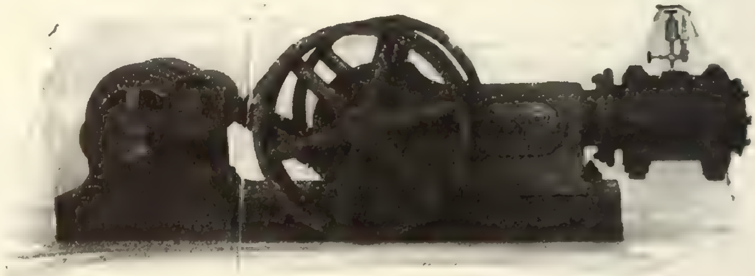

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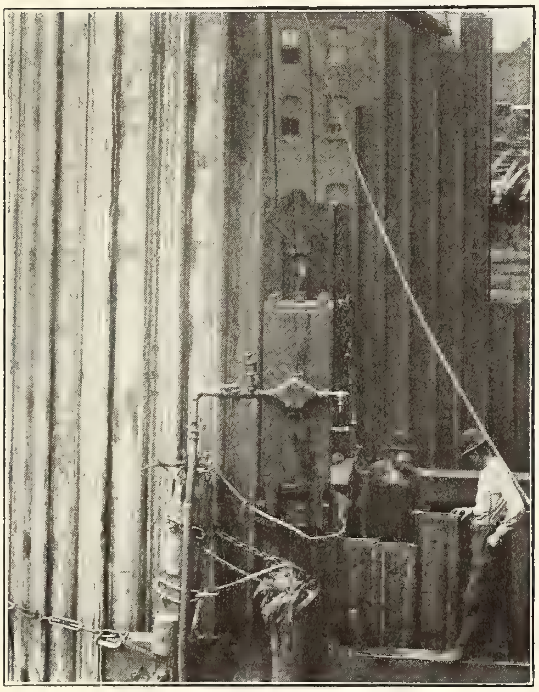

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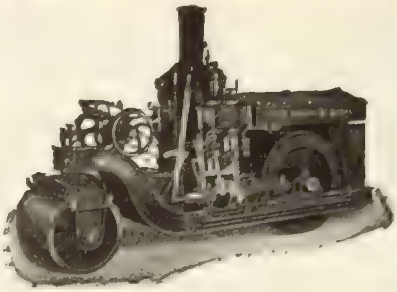

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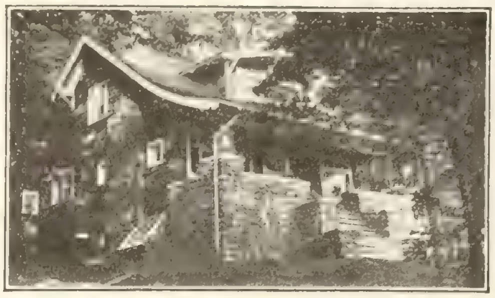

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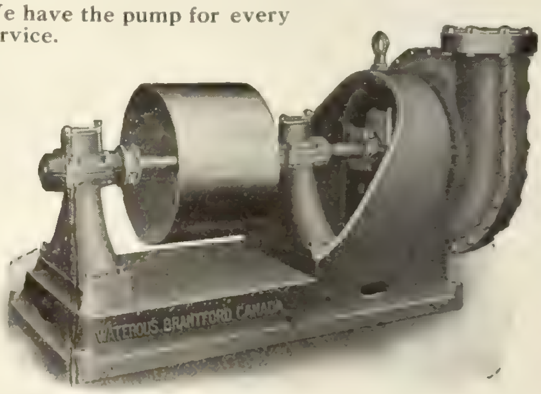

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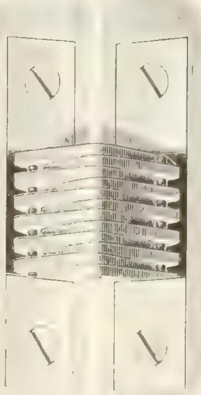

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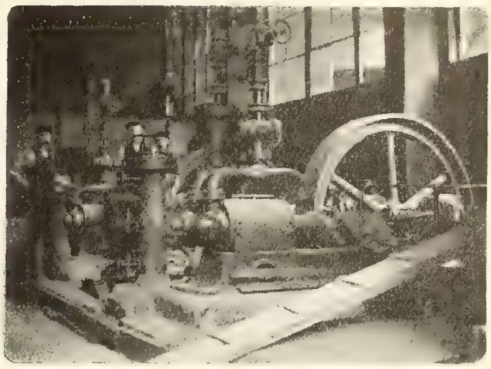
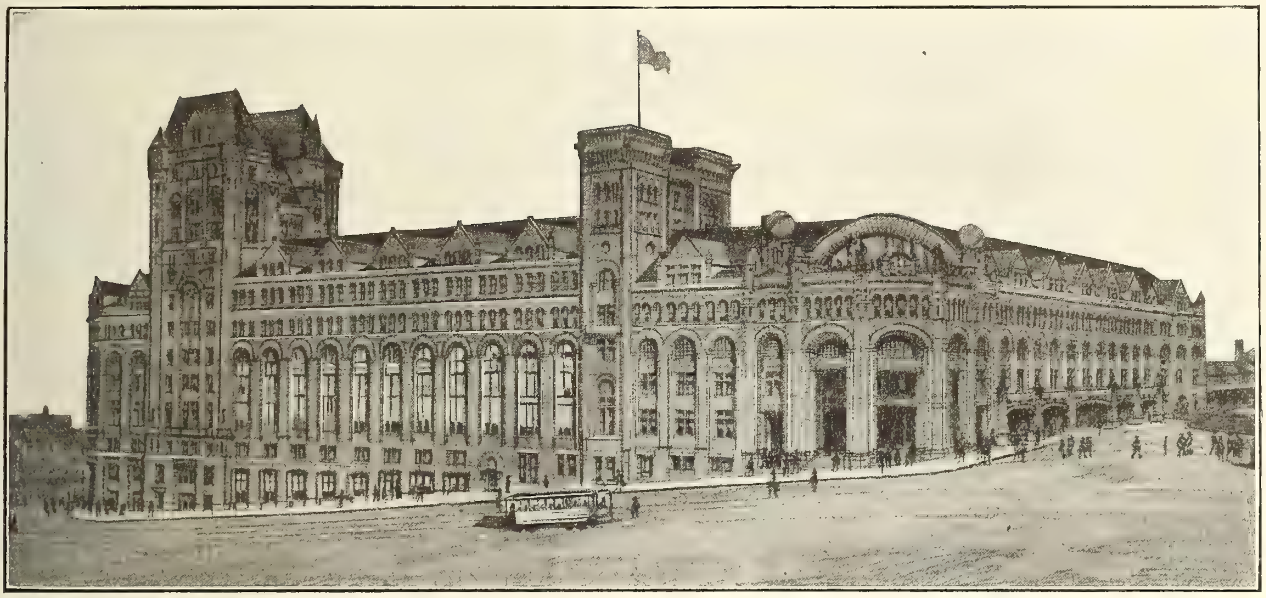


Plant in course of construction at Windsor Station



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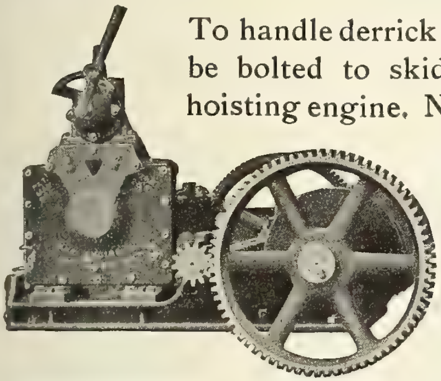

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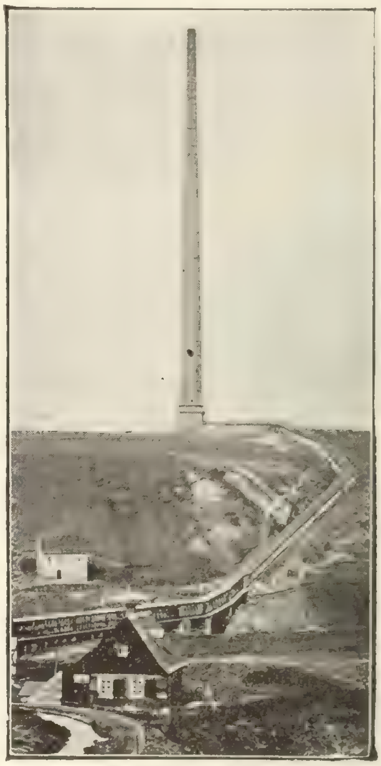

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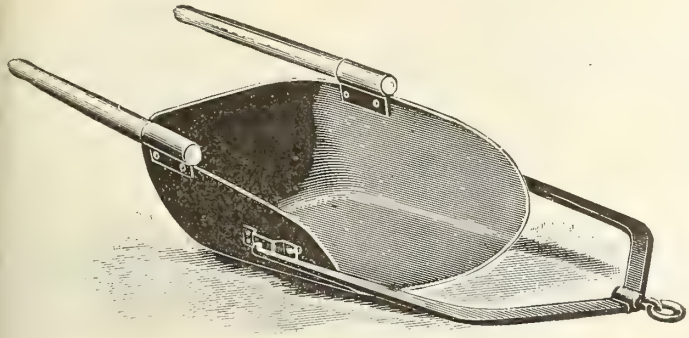

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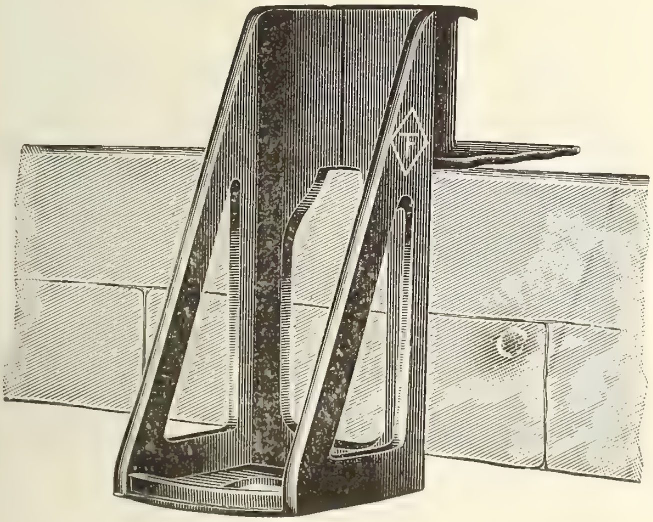

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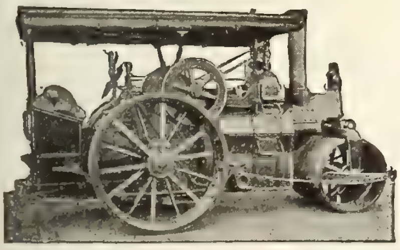

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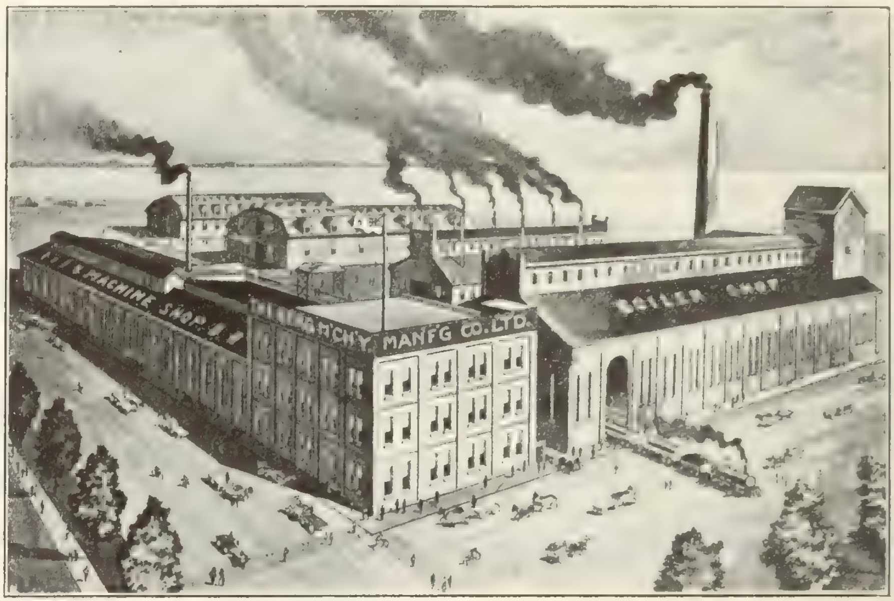

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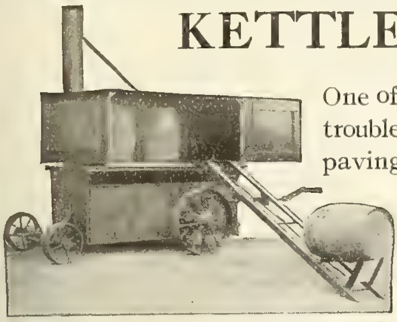

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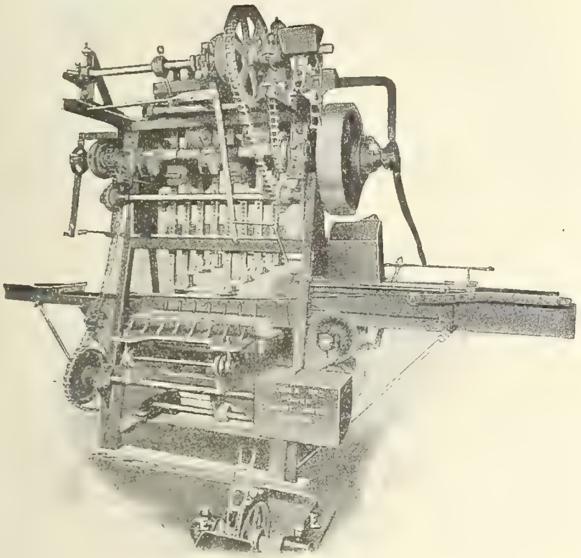

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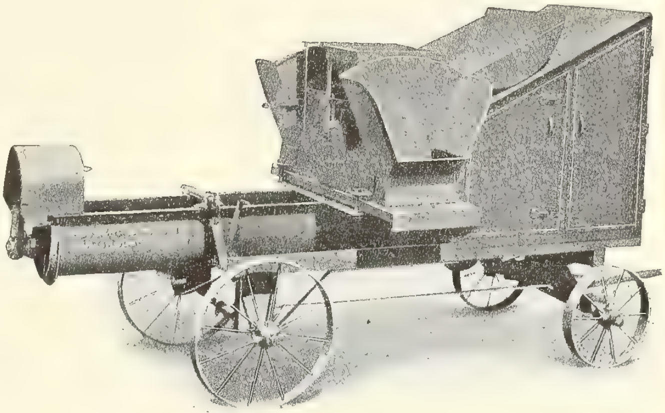

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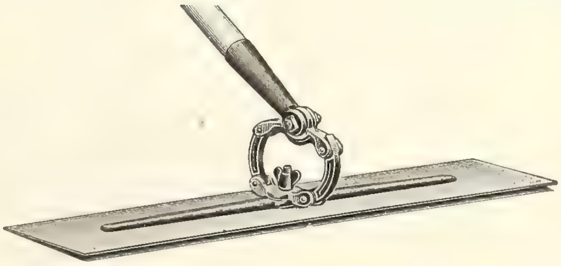

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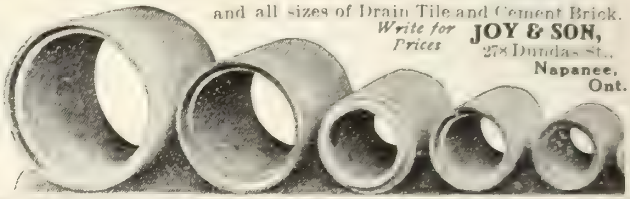

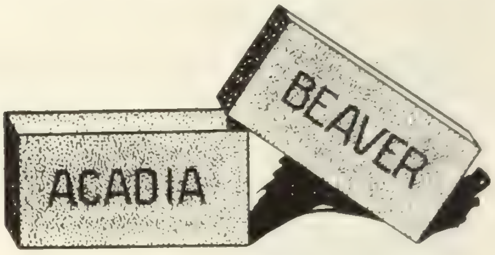

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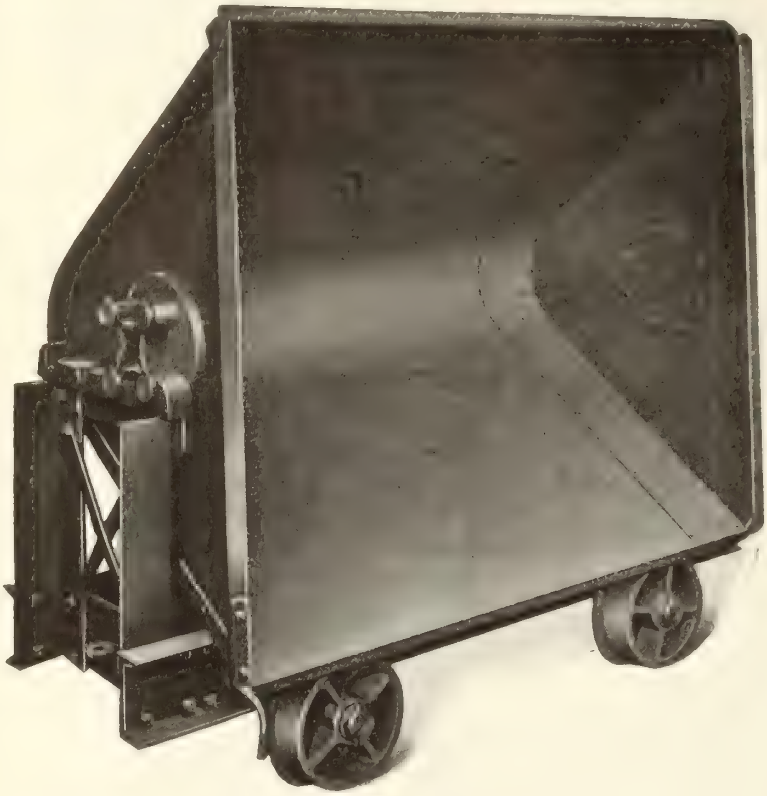

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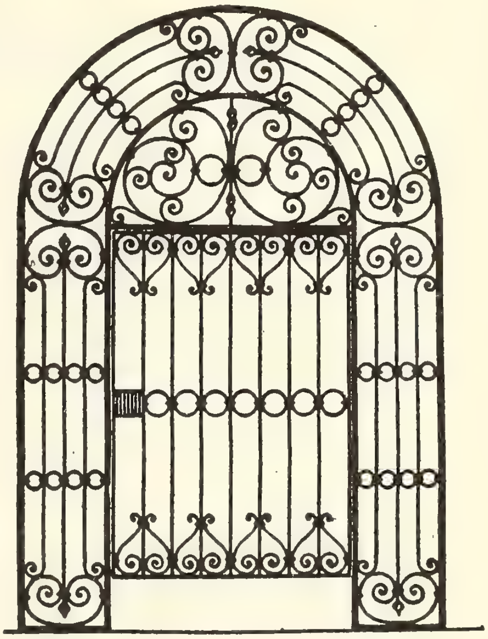

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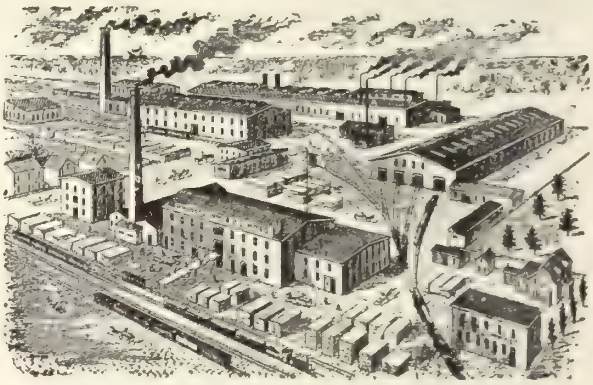

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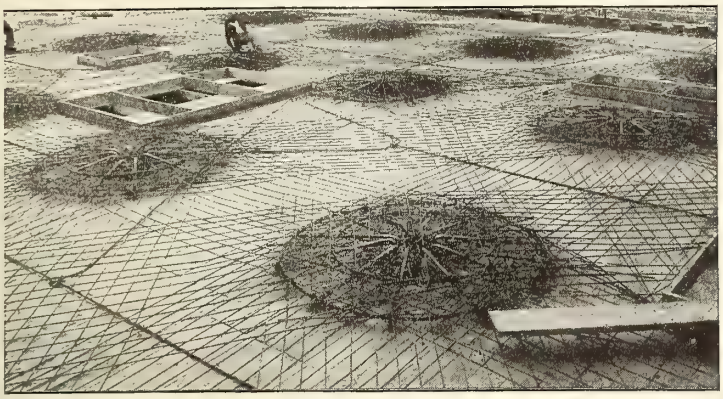

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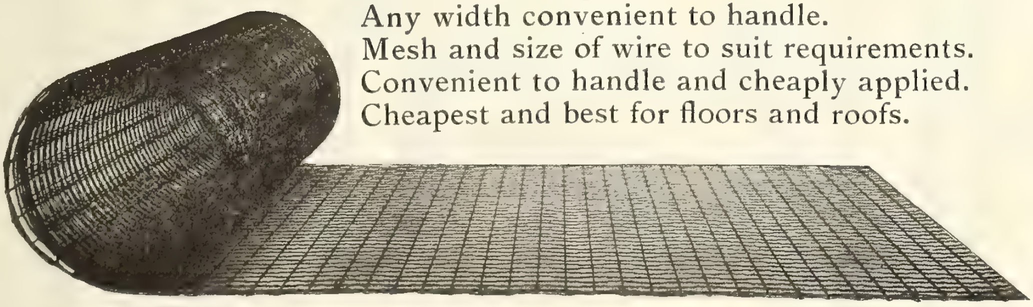

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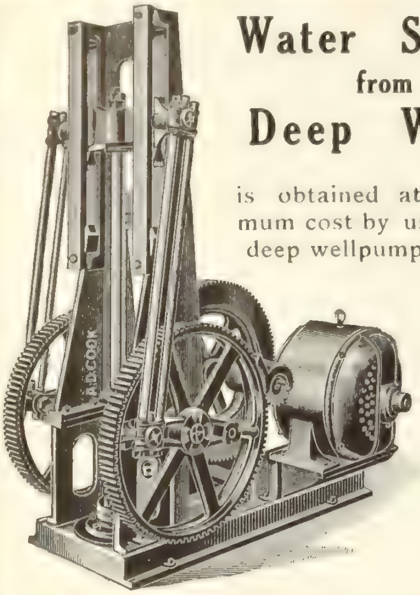

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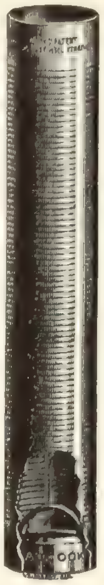

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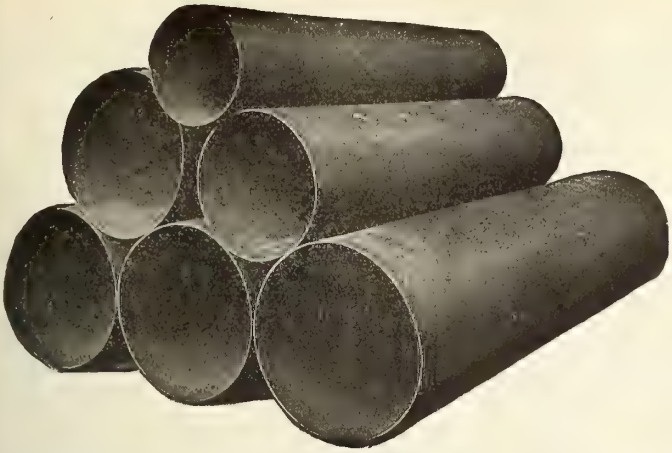

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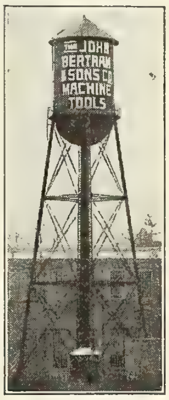

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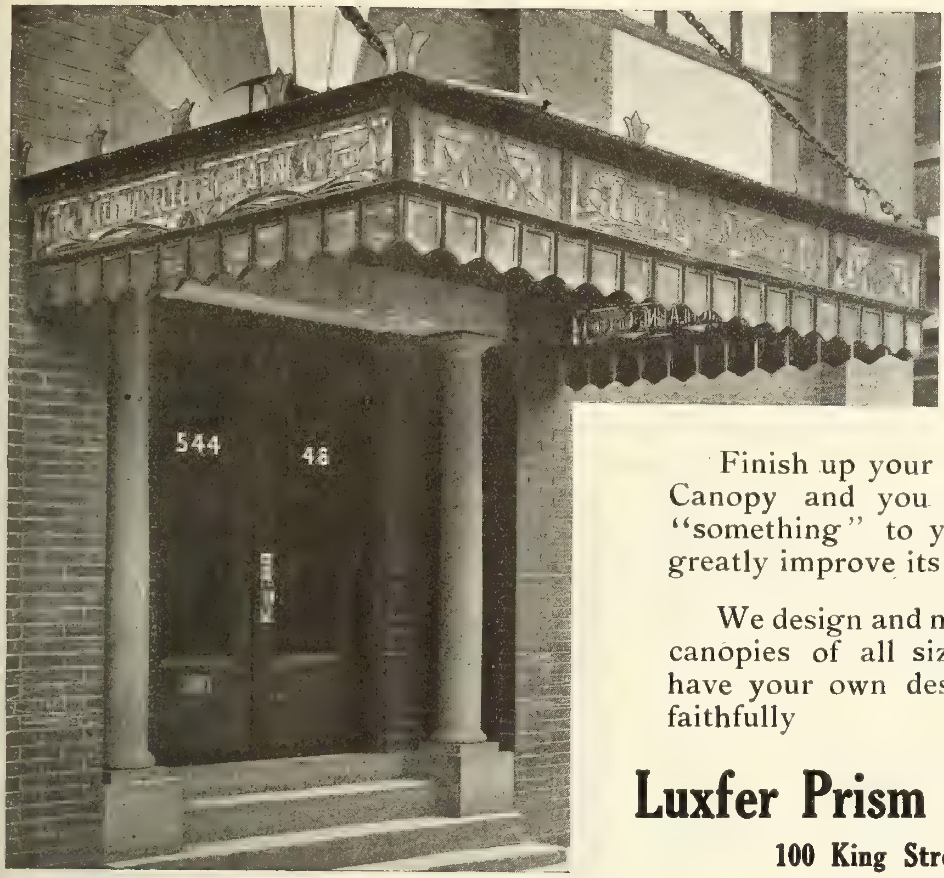

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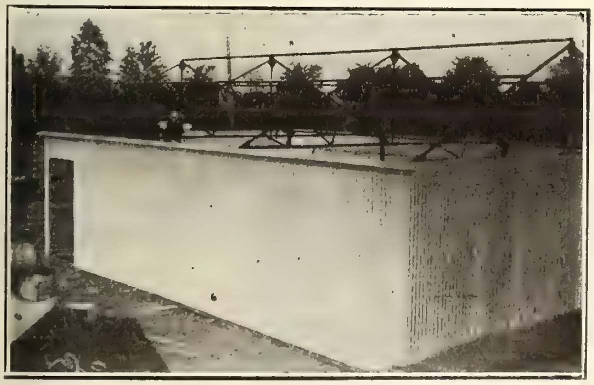

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Phone Adelaide 2377 **528 FRONT STREET WEST, TORONTO**

Ornamental Wrought Iron Work

We make and design

Wrought Iron Brackets — Lanterns and Lamps — Lamp Standards — Grilles and Railings

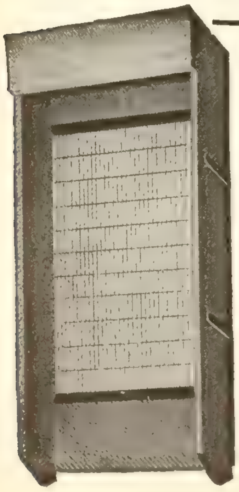
Architects designs executed with fidelity and spirit

Dennis Wire & Iron Works Co.
London, Ont. Limited

Toronto Branch : 36 LOMBARD STREET

Dominion Marble Company
Limited
Montreal, Que.

SOLE producers of the Beautiful Royal Dominion marble quarried at South Stukely, Que. A card or 'phone call will bring our representative to submit figures on any class of marble work. Address all letters to the Company P.O. Box 1166, Montreal.



NOW is the time to renew your

SAND and GRAVEL SCREENS

We make **SCREENS** for all purposes

Concrete Reinforcement, Window Guards, General Wire and Ironwork.

Shall be pleased to quote you.

Canada Wire & Iron Goods Co.
Hamilton

Pioneer Manufacturer of

Hotchkiss Steel Forms

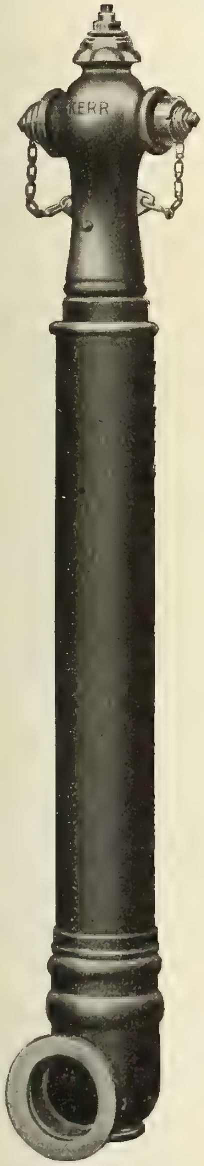
For walks—curbs—curb and gutter combined—driveways, roads, pavements, etc.

The benefit of 20 years experience as successful contractors.

Yours for the Asking

Hotchkiss Lock Metal Form Co.
BINGHAMPTON, N.Y.

KERR



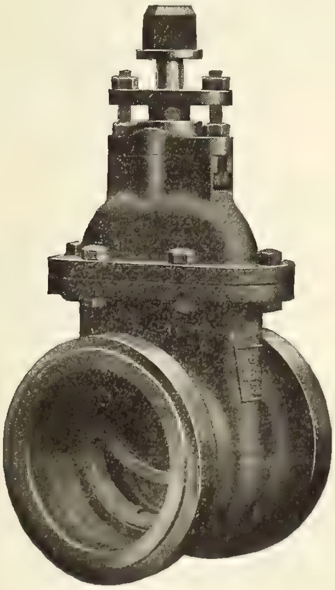
Hydrants and Gate Valves

are made with Hub for Cast Iron, Wood or Steel pipe spigots. They have full area of waterway, and are strong, compact and modern in design and construction.

Standard Compression Hydrant

Send us your Specifications and Enquiries.

Prompt attention given.



6″ Hubbed

THE **KERR ENGINE CO.**
LIMITED
WALKERVILLE, ONT.

Residence of A. J. Gough of Sellers-Gough Fur Co., Ltd., Toronto

Efficiently Cleaned by TUEC Stationary Air-Cleaning System

EQUALLY WELL SUITED TO THE LARGEST BUILDING OR SMALLEST RESIDENCE

CANADIAN TUEC DISTRIBUTORS
Tuec Co. of Vancouver—601 Pender St. West, Vancouver.
Tuec Co. of Winnipeg—419 Portage Ave., Winnipeg, Man.
Tuec Co. of Calgary—812 First St. West, Calgary, Alta.
Tuec Co. of Montreal—406 New Birks Bldg., Montreal, Que.

Canadian Factory—B. O. T. Building,
159-61 Richmond St. W., Toronto—Jas. J. Martindale.

Current Prices of Building Material

BRICKS

The following are wholesale prices delivered at Toronto:—

	Per M
No. 1 dry pressed red brick	$18 00
No. 1 dry pressed buff brick	18 00
Red Stock Bricks	13 00
Grey Stock Bricks	13 00
Wire cut bricks for foundation work ...	12 50
Porous terra cotta bricks	15 00
No. 1 enamelled bricks, all colors, from	$80 00 to $150 00
Sand-Lime Bricks	11 00

LUMBER (Building Material)

Hemlock Lumber—

2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$27 00	
2 x 4 to 2 x 12, 16 ft.	27 00	
2 x 4 to 2 x 12, 18 ft.	30 00	
1 in. Hemlock, No. 1	26 00	28 00
No. 1 Hemlock Decking	26 00	28 00
No. 2 Hemlock dimension and 1-in.	20 00	22 00

Pine -

1 in. common pine 8 to 12 in. wide rough	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
⅞ x 8 and 10 in. pine shelving..	36 00	42 00
⅞ x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine desking D2S	30 00	
Spruce Decking	28 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

Pine trim for paint finish—

4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8-in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

Shingles—

XXX B. C. Clear Shingles, per M.	3 90
N. B. Extras	3 75
N. B. Clears	3 10
No. 1 pine lath, per M.	5 00
No. 2 pine lath	4 50
No. 1 spruce lath	4 00

Cedar Posts—Fence—

5 in. at small end, each	30
7 in. at small end, each	35
Hemlock lath	3 50

Dimension Timber up to 32 feet:

8x8, 10x10, 10x12, 12x12, 12x14	32 00
8x10, 8x12, 10x14, 14x14	34 50
8x14, 12x16, 14x16, 16x16	34 50
10x16, 14x18, 16x18	35 50
8x16, 12x18, 18x18	36 00
10x18, 14x20, 16x20	36 50
8x18, 12x20, 18x20	37 00
10x20	37 50
8x20, 14x22, 16x22, 18x22, 20x22, 22x22	38 50
12x22	39 00
10x22	39 50
8x22, 14x24, 18x24, 20x24, 22x24, 24x24	40 50
12x24	41 00
10x24	41 50
8x24	43 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

	Star	D.D.
10 to 25 united inches	$4 25	$ 6 25
26 to 40 "	4 60	6 75
41 to 50 "	5 10	7 50
51 to 60 "	5 35	8 50
61 to 70 "	5 75	9 75
71 to 80 "	6 25	11 00
81 to 85 "	7 00	12 50
86 to 90 "		15 00
91 to 95 "		17 50
96 to 100 "		20 50
101 to 105 "		24 00
106 to 110 "		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for box lots:—

MONTREAL

	Star	D.D.
25	$3 25	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
90		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 u.i.	$3 50	$5 00
26/40	3 75	5 50
41/50	4 25	6 25
51/60	4 75	7 00
61/70		8 00
71/80		9 00
81/85		10 00
86/90		11 00
91/95		13 00
96/100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

STEAM FITTERS' AND PLUMBERS' SUPPLIES

Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock ...... net $1.85

No. 4½ Fuller's .... net $2.50

Square head brass cocks, 65 per cent.

Lead Pipe

Lead pipe, $7.50, less 5 per cent.; lead waste, $9.00, less 5 per cent.; caulking lead, 7 cents per lb.; traps and bends, 40 per cent.; pig lead, 5¾ cents per lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.28	¼ inch	$3.18
⅜ "	2.28	⅜ "	3.18
½ "	2.72	½ "	3.57
¾ "	3.28	¾ "	4.43
1 "	4.85	1 "	6.55
1¼ "	6.56	1¼ "	8.86
1½ "	7.84	1½ "	10.59
2 "	10.55	2 "	14.25
2½ "	16.67	2½ "	22.52
3 "	21.80	3 "	29.45

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

Soil Pipe and Fittings

Medium and extra heavy pipe and fittings, up to 6-inch, 60 and 5 per cent.

7 and 8-inch pipe, 45 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

CEMENT, STONE, STEEL, Etc.

Cement, barrel lots, in bags, delivered, Toronto, bags extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ¾-inch, $1.45.

Burnt River rubble stone delivered, $17 to $18 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¾ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

Free stone delivered, $17 to $18 per toise.

Brown coursing stone, delivered, $3.75 per yard.

Grey coursing stone, delivered, $2.50 to $2.75 per yard.

Sand, for cement or brick work, $1.15 a cubic yard, f.o.b. Toronto, C. P. R. sidings.

Sand, for cement or brick work, 90c to $1.05 a cubic yard, f.o.b. Toronto, G. T. R. sidings.

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

Steel channels and beams, angles and plates, $2.65 to $3.00 per 100 pounds, delivered f.o.b. Toronto.

Hard Wall Plaster, unsanded, from $7.00 to $8.50, bags extra; sanded, $4.00 in car lots; hydrated lime, $10.00 in car lots.

Lime, per cwt., delivered, not less than 1,500 lbs. 33 cents; white, 43 cents.

Plaster of Paris, Anchor and Crown Brands, $1.50.

Manilla Rope, best, per pound, 12½ cents.

PAINT AND OILS

Pure White Lead, ground in oil, $9.00 per 100 lbs.

Boiled Linseed Oil in bbls., 6 c per gal of 9 lbs.

Raw Linseed Oil, in bbls., 6 c per gallon.

Turpentine, in barrels, 56c per gallon.

Pure Red Lead, dry $7.00 to $8.00 per 100 lbs.

Putty, pure linseed oil, in bulk, bbls., 3½c.

Putty, pure linseed oil, in 25-lb. tins, 4c.

Argenteuil Granite Co., Limited

42 Craig Street West, MONTREAL

We are in the market to bid on your plans for granite on buildings.

Our up-to-date cutting plant, excellent quarries and good shipping facilities enable us to make close prices.

SEND US BUILDING PLANS TO-DAY

MISSISQUOI-LAUTZ CORP'N LIMITED

Producers, Importers and Workers in Marble

ANNOUNCE
the opening of their New Office and Showroom at

208 Read Building,
MONTREAL

Displaying a complete line of **MISSISQUOI** And all varieties of Foreign **MARBLES**

Which are open for inspection at all times
to Architects, Builders and Contractors.

Any Request to Submit Tenders Will be Given Prompt Attention.

Trade Mark

LUNDY SHOVELS

Competition is met and profitable contracting achieved by the use of up-to-date equipment in every branch of the contracting business.

When it comes to digging let your men do more efficient work by supplying them with "Lundy" or "Dandy" shovels.

They enjoy a national reputation for rigid construction and durability.

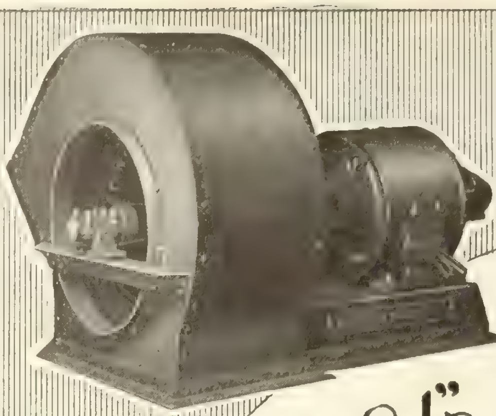
We will send to any contractor, free, express prepaid a sample shovel. Send for our illustrated catalogue showing our full line of Shovels, Spades, Scoops, Draining Tools, etc.

THE LUNDY SHOVEL & TOOL CO., LTD.

General Office and Works: PETERBORO, ONTARIO

ONTARIO AGENT
N. B. Misener, Toronto

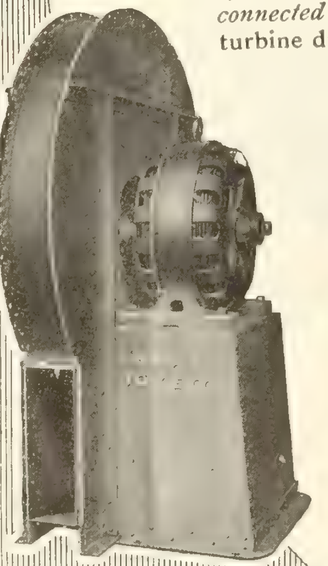
SELLING AGENTS
Delorme Bros., Montreal; Tees & Persee, Ltd., Winnipeg
Tees & Persee of Alberta, Ltd., Calgary; E. E. Crandall, Vancouver, B.C.



"Buffalo" Fans

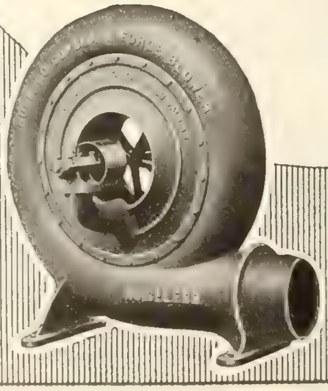
For Heating, Ventilating, Drying and Exhausting.

Ask our engineers to recommend the fan best suited to your requirements. Our designs include the new high-efficiency "*Conoidal*" multiblade fan, used extensively for heating systems, mine and tunnel ventilation, and the motor-driven *Steel Plate Pressure Blower*, giving pressures up to 24 oz. Both of these designs show higher efficiency than obtained with any similar types. We specialize in *direct-connected* units (motor, engine or turbine driven) for every service. These are distinguished by absence of belt troubles and the very lowest power consumption. Whatever your problem write us.



CANADIAN BUFFALO FORGE Co., Limited

Montreal
St. John Toronto
Winnipeg Vancouver



Structural Water-proofing

"DEHYDRATINE"

For Water-proofing under the membranous method.

"HYDRATITE"

For Water-proofing Concrete.

"FERRO FAX"

For Surface Hardening Concrete Floors.

"SYMENTREX"

A Cement Coating—Makes Surfaces Water Shedding.

MADE IN COLORS

"These Trade Names protect you against the possible selection of inferior materials. Whether you prefer a water-proof paint or a compound, we can give you satisfactory assurance as to the reliability of these products."

"FOR 15 YEARS STANDARD OF THEIR KIND."

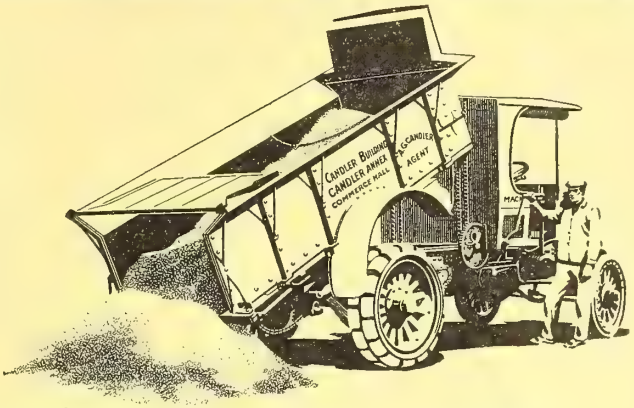
Pinchin-Johnson & Co.
(Canada) Limited
Minerva House, - Toronto

Write for Particulars and Architect's Hand Book (1913 edition)

AGENCIES IN ALL CITIES

MACK

A Mack Truck That Replaced Five Double-Teams In Winnipeg



The five-ton Mack Dumping Truck shown here is owned by the Lake Winnipeg Shipping Company, Limited, and it has replaced five double teams, the service of which teams would cost approximately $30.00 per day. This truck is engaged in hauling gravel, sand and rubble from the docks to various points throughout the city. The heavy mud which forms on the unpaved roads after rainfalls does not interfere with its operation.

We have records of hundred of five-ton Mack Trucks that are earning from $30.00 to $50.00 per day.

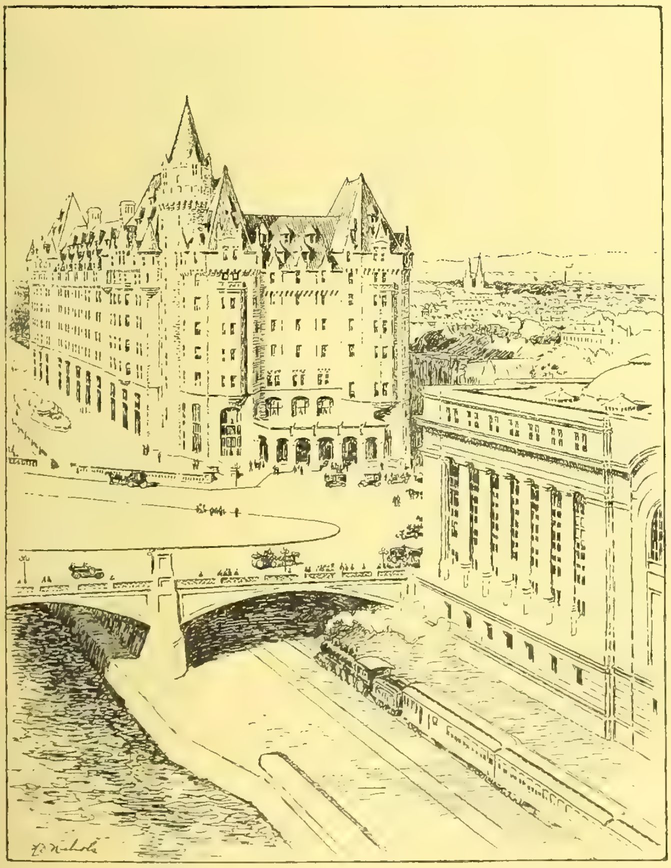
Mack Trucks have proven their reliability, economy and long life by 12 years of real service in every line of transportation.

You should investigate the Mack before buying a truck. Ask us to show you.

The Canadian Fairbanks-Morse Co., Limited

St. John, N. B. Quebec Montreal Ottawa Toronto Winnipeg Saskatoon Calgary Vancouver

9



Across Canada with the

Imperial Wire & Cable Company, Limited

Toronto Montreal Winnipeg

Second of a series of advertisements showing buildings of national importance which have been wired with Imperial Wire and Cable Co's. Limited, wires.

This picture shows

Chateau Laurier and Grand Trunk Central Station, Ottawa

These buildings were wired throughout with "Adanac" Rubber Insulated Wire.

Architects: Ross & McFarlane, Montreal.
Engineers: Westinghouse, Church, Kerr & Co., New York.
Electrical Contractors: Western Electric Co., New York.

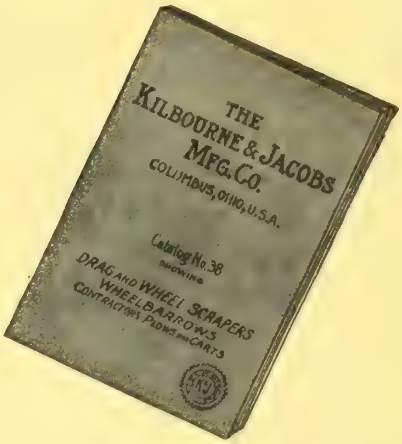
Address our nearest office, **Montreal, Toronto, Winnipeg**

Alberta and British Columbia enquiries may be addressed to our Sales Agents, Northern Electric & Manufacturing Co., Limited, Calgary and Vancouver.

A Catalogue—

Every Builder and Contractor should have.

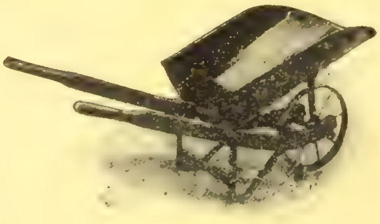
**Have you received
your copy of
K. & J. Catalogue
No. 38?**



THE
KILBOURNE & JACOBS
MFG. CO.
COLUMBUS, OHIO, U.S.A.
Catalog No. 38
SHOWING
DRAG AND WHEEL SCRAPERS
WHEELBARROWS
CONTRACTORS PLOWS AND CARTS

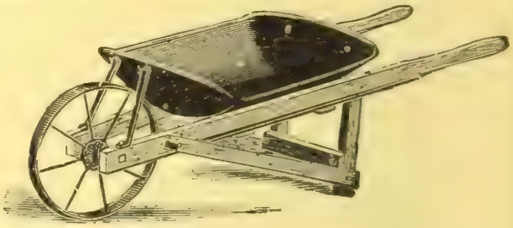
**Have you received
your copy of
K. & J. Catalogue
No. 38?**

This New No. 38 Kilbourne & Jacobs' Catalogue illustrates and describes fully every style of barrow, wheel or drag scraper and plows. You may require equipment of this description—perhaps not at the moment but later on. This book will surely be of assistance to you as you can select the proper style of barrow, etc., for your requirements. Let us send you a copy—free for the asking.

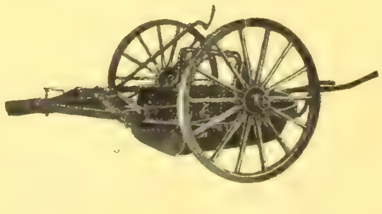


"Kilbourne & Jacobs" Wheel Barrows

All styles in
stock



Wheel and Drag Scrapers



F. H. Hopkins & Co.

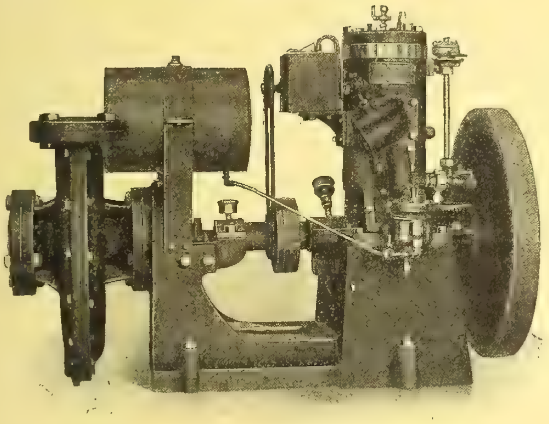
MONTREAL

BRANCH OFFICES: General Supply Company of Canada, Ltd., Winnipeg Agents
Ritchie Contracting & Supply Company, Ltd., Vancouver Agents

Vol. 27 Toronto, September 3, 1913 No. 36

ESTABLISHED 1886

Contract Record and Engineering Review



We manufacture all kinds of Steam and Power Pumps for all kinds of services, using only the best material and workmanship.

THE SMART-TURNER MACHINE CO.
HAMILTON, CANADA LTD.

"MADE IN CANADA"

Bent Glass

Made in all Kinds of Glass on Short Notice

Large Bent Plate Glass for Shop Fronts a Specialty

The Toronto Plate Glass Importing Company, Limited
(HILL & RUTHERFORD, Managing Directors)
Head Office and Works: 91 to 133 Don Roadway
TORONTO

INGERSOLL-RAND

SHEET PILE DRIVERS

—Prove the Value of Experience.

—Utilize all the Energy.

—Have Standard Mechanism.

—Are Handled with Facility.

Send For K-139.

Canadian Ingersoll-Rand Co., Limited
MONTREAL, CAN.

Continuous and Machine Banded Wood Stave

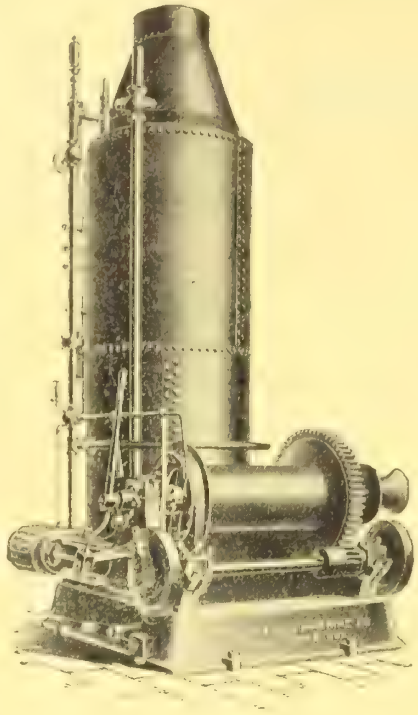
WATER PIPE

RESERVOIR TANKS

for city and town Water Systems, Fire Protection, Power Plants, Hydraulic Mining, Irrigation, etc. One-half the cost of Iron Pipe—and better.

Pacific Coast Pipe Co., Limited
P. O. Box 563 Vancouver, B. C.
Office and Factory, Granville St., near High Bridge
WRITE FOR CATALOGUE
Full Particulars and Estimates Furnished

Alphabetical Index of Advertisers, Page 16 Classified Directory to Advertisements, Page 6



Hoisting Engines

¶ To the Contractor who wants a good reliable and efficient hoisting engine,—one that will always be right on the job—we suggest an inquiry into our wide range of this type of machine.

Any one of our offices will help you find the engine best suited to your needs.

The JENCKES MACHINE COMPANY, Limited

General Offices: SHERBROOKE, QUE.

WORKS: SHERBROOKE, QUE. ST. CATHARINES, ONT.

Sales Offices: Sherbrooke, St. Catharines, Nelson, B.C., Vancouver, Montreal, Cobalt, S. Porcupine

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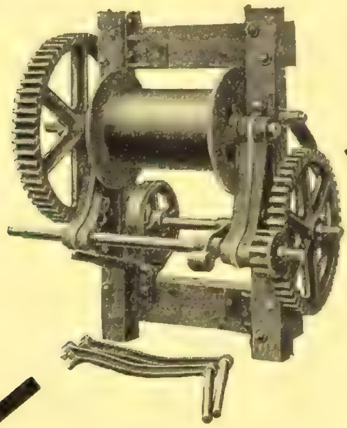


"AMERICAN" CRABS

Develop More Power For Less Effort Than Any Other Crabs Made

All castings are heavier and more massive than on ordinary crabs and they are better finished. Wherever possible they are set into the heavy wood frame, not merely bolted to it. All working parts are secured to the two massive side castings. These castings are absolutely one piece and are set into the frame, consequently all working parts maintain their alignment perfectly. The corner braces are heavy castings bolted securely. For taking up slack rope quickly a crank may be used on the drum shaft.

"AMERICAN" Crabs are made with single and double drums, for both wire and manila rope. Made by

American Hoist & Derrick Company

St. Paul, Minn.

—— SOLD BY ——

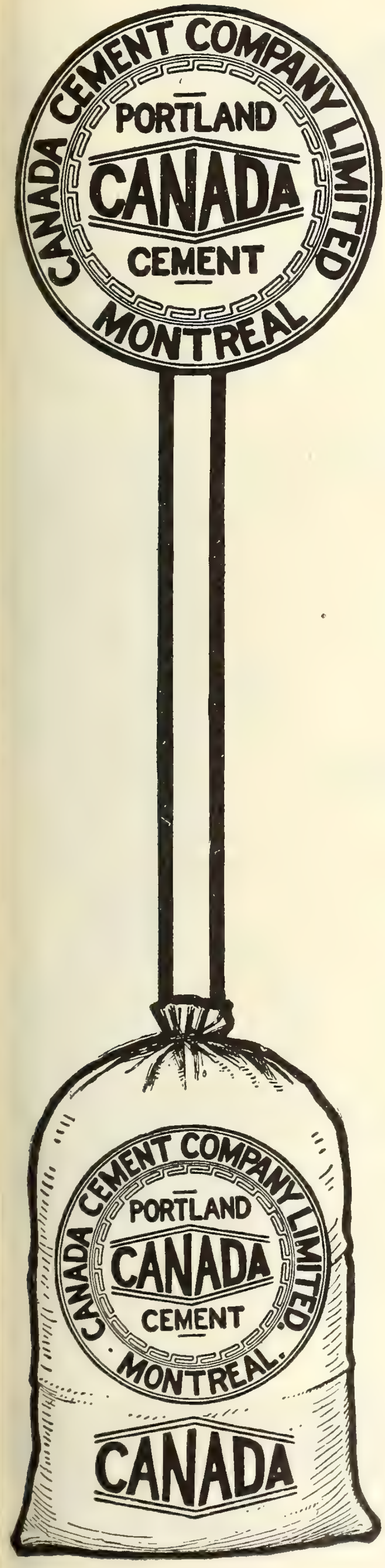
General Supply Co. of Canada, Ltd., Montreal, Ottawa, Toronto, Canada.
Stuart Machinery Co., Winnipeg Man. Vancouver Machinery Depot, Ltd., Vancouver, B. C.
Gorman, Clancey & Grindley, Edmonton and Calgary, Alta., and Nelson, B. C.

PERMANENCE

an ideal that is now attainable

THE superiority of concrete over all other materials for the building of permanent structures, is now generally admitted.

The next step towards ideal construction, is to realize that for satisfactory concrete work, it is necessary to use a cement that is uniformly high-grade.



CANADA Portland CEMENT

is the selection of the leading engineers, architects and contractors. Their experience has proved that in this brand they can obtain a certainty of success.

With concrete coming into more and more general use for the construction of buildings, bridges, viaducts and highways, it is vitally important that those in authority on such matters should select the best materials obtainable.

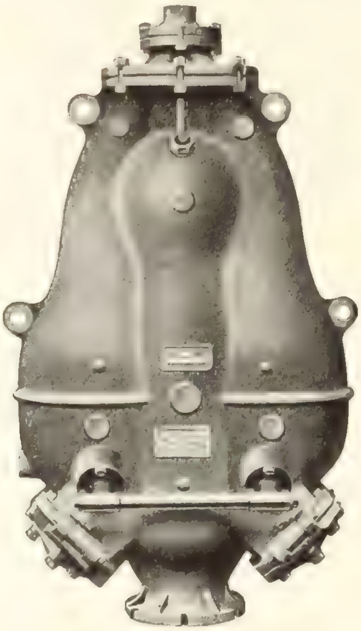
Use the cement that our best architects and engineers have selected for their most important undertakings. Select Canada Cement—it costs no more than any other.

Canada Cement Company Limited
Montreal

Sales offices at
Montreal Toronto Winnipeg Calgary

PUMPS

For all Purposes.



Pulsometer Pump

FOR

CONTRACTORS,

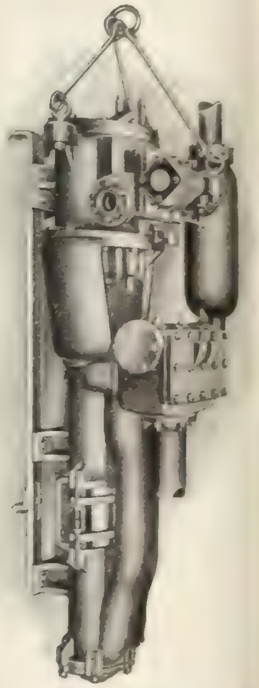
MINES,

QUARRIES,

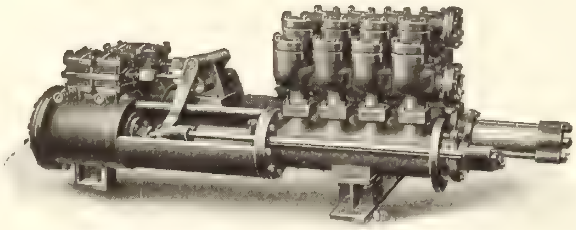
MUNICIPALITIES,

ETC., ETC.

Operated by
Steam,
Gasoline,
Electricity.



Knowles Vertical
Sinking Pumps



Knowles Duplex Boiler Feed Pump
—Piston Pattern

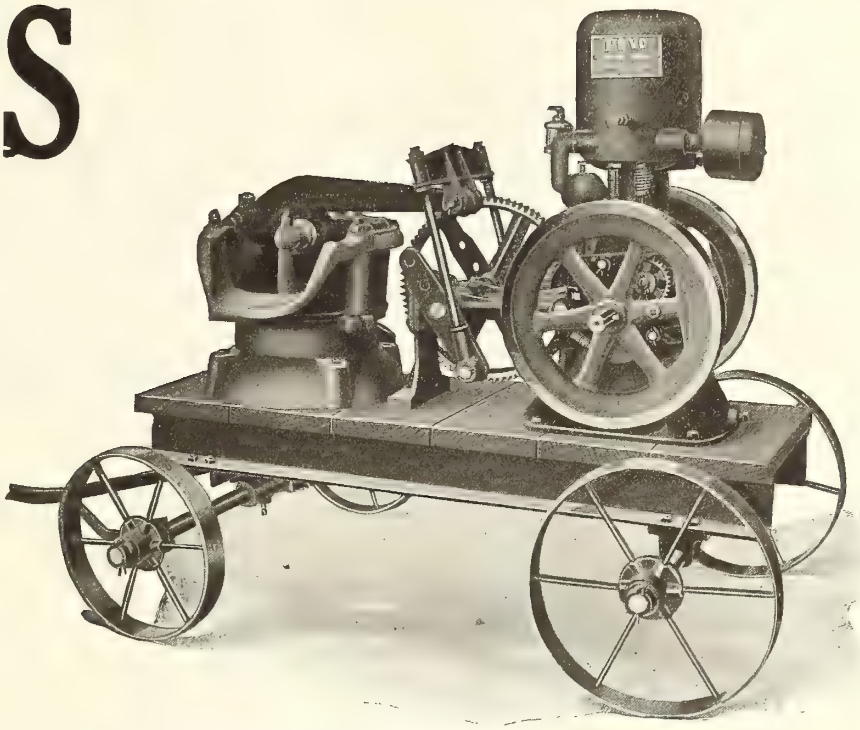
Write for
Catalogues.

Montreal, 318 St. James St.
Toronto, 155 West Richmond St.
Cobalt, opp. Right of Way Mine.
Winnipeg, 259-261 Stanley St.

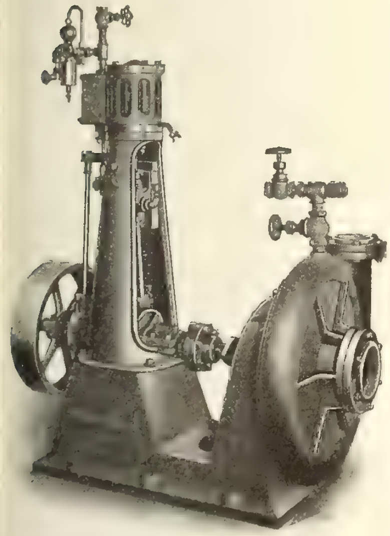
MUSSENS

PUMPS

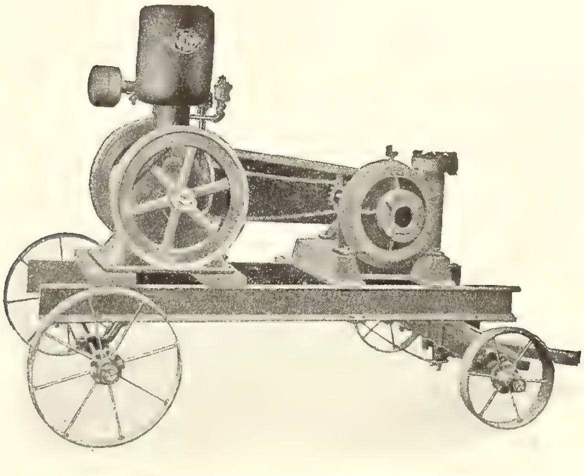
OF ALL KINDS CARRIED IN STOCK



Novo Trench Pump, on Trucks with Gasoline Engine



Swaby Centrifugal Pump,
with Steam Engine.



Novo Centrifugal Pump, on Trucks
with Gasoline Engine

LIMITED

Calgary, 10th Ave. & 3rd St. E.
Vancouver, 365 Water Street
Quebec, 71 Maple Ave.
St. John, N. B., 57 Smythe St.
Halifax, 78 Granville St.

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- Canadian Fairbanks-Morse Co.
- Can. Ingersoll-Rand Co., Ltd.

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- Mussens Limited.
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- Gartshore-Thomson Pipe Co.
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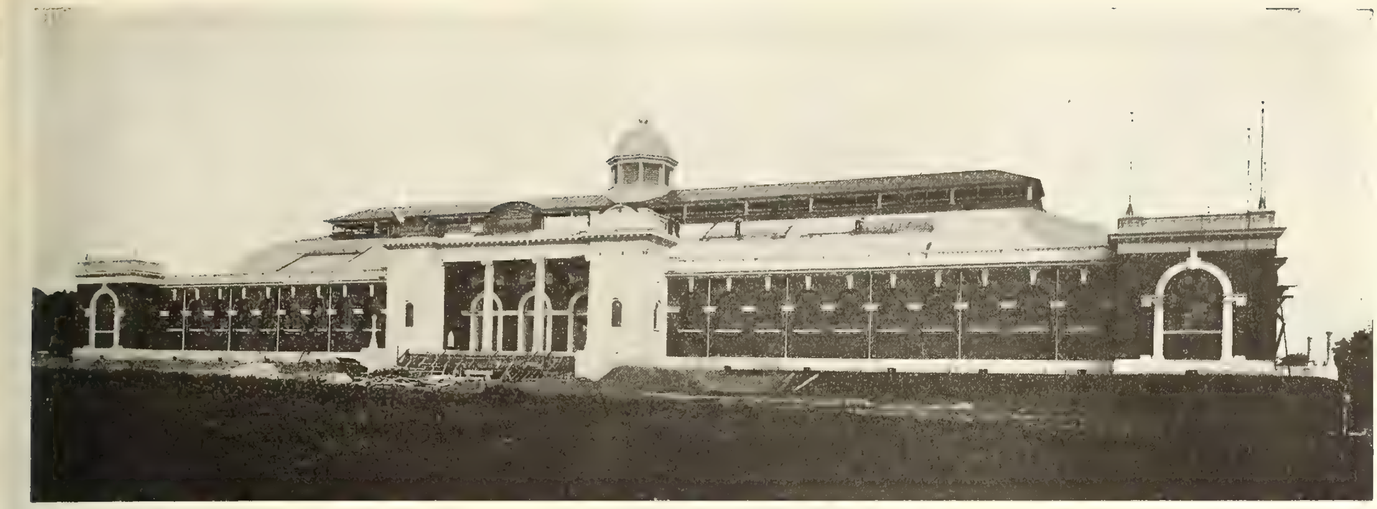


Transportation Building, Canadian National Exposition, Toronto.

BUILT OF

Don Valley Bricks

THE building pictured above is admired by a million people annually and it is constructed of Don Valley Bricks.

This material was selected for its proven ability to withstand the destructing influence of time and erosion.

In every part of Canada may be found buildings of Don Valley Brick and Terra Cotta Fireproofing.

Specify Don Valley

Don Valley Brick Works

Toronto, Ont.

Wettlaufer Bro's
IMPROVED CONCRETE & ROAD MACHINERY

MIXERS

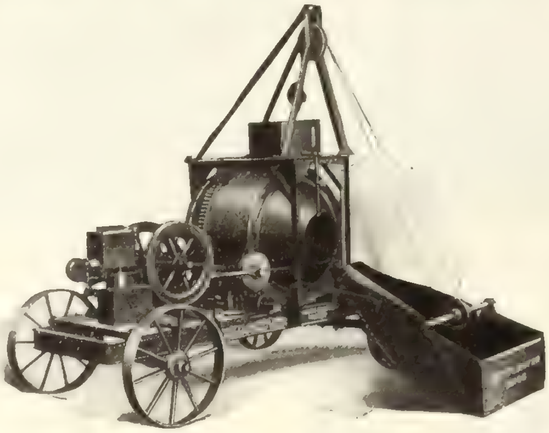
TILE MACHINES

CRUSHERS

HOISTS

BRICK MACHINES

PUMPS



Wettlaufer Mixers

IN every line of manufacturing there is a standard by which all products in that line are judged. When it comes to concrete mixers the standard is the Wettlaufer mixer.

It is made in many styles and sizes and includes special features and advantages not found in any other mixer.

Wettlaufer mixers are noted for their unusual wearing qualities and for their thorough mixing.

Let us demonstrate our claims.

Write for Catalogue.

Wettlaufer Bros.

178 Spadina Ave., Toronto, Ont.
Factories: Mitchell, Ont., Buffalo, N.Y., Detroit, Mich.

AGENCIES:

A. E. Hodgert, Regina, Sask. Maysmith & Lowe, 1057 Mears St., Victoria, B. C. A. R. Williams Machinery Co., 15 Dock St., St. John, N.B. The Canadian-British Engineering Co., Ltd., 324 Smith St., Winnipeg, Man. R. F. Mancill, 117 10th Ave. East, Calgary. The Hallman Machinery Co., 374 Alexander St., Vancouver, B.C. J.-L. Lachance, Ltd., 363 St. Paul St., Quebec. Wettlaufer Bros., 316 Lagauchetiere St. West, Montreal, Que.

THE FAMOUS WETTLAUFER HEARTSHAPE MIXERS

Crushed Stone

If you want crushed stone in a big hurry come to us and you will get it.

Our bins are always loaded to the top with stone of all grades and shipments can be made the day your order is received.

Quarries located at Dundas and Vinemount.

Portland Cement

Our several cement mills are located at various points that enable us to make prompt shipments with short hauls.

Send us your next order.

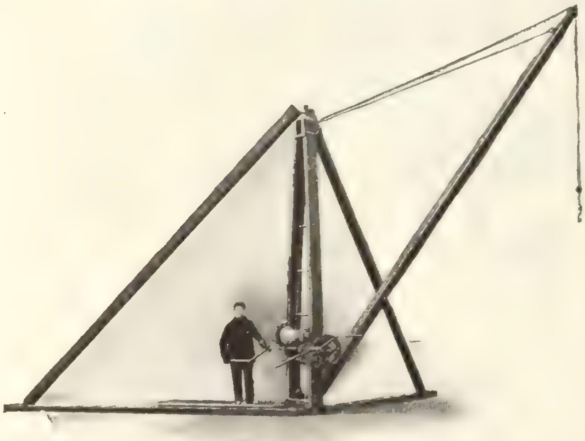
Alfred Rogers

Limited

28 King St. West, Toronto

Beath Scotch Derricks

Hand or Power



THE construction of Beath Scotch Derricks embodies several points of merit not found in other makes.

All stress parts are **steel** not cast iron. Bottom Pintle Bearing is of ball and socket type and works in a bath of oil, thus ensuring an easy movement at this joint.

Beath Derricks are provided with self-oiling bearings, ensuring easy operation and reducing wear to a minimum.

We also make Jinniwink Derricks, Stiff Leg Derricks, Guy Derricks, and Steel Derricks for heavy service. Hand or Power operated.

Send us your enquiries for Derricks

W. D. Beath & Son, Limited

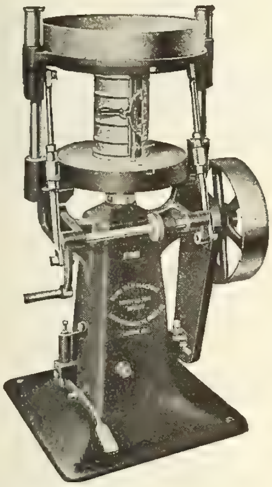
ENGINEERS AND MANUFACTURERS

20-30 Cooper Ave., Toronto

The A. M. Ellicott Co., 301 St. James St., Montreal, Que., sole selling agents for Province of Que.

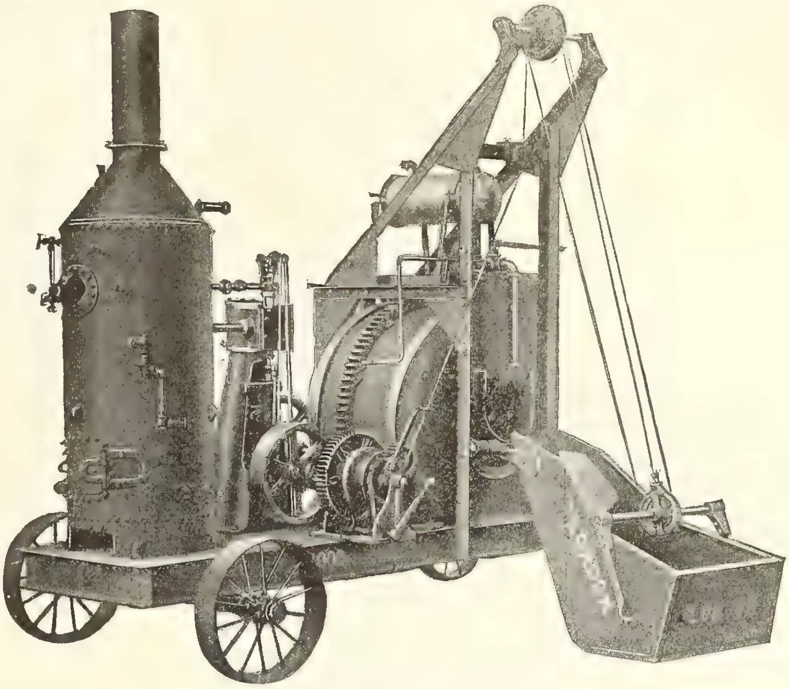
LONDON CONCRETE MACHINERY

Is Not Built Down to a Price, but Up to a Standard.



Dunn Cement Drain Tile Machine

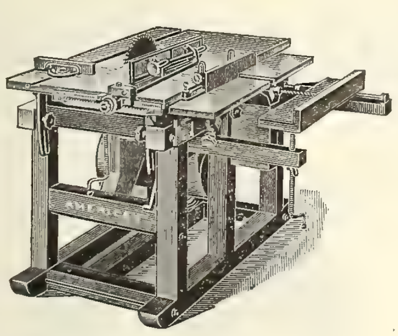
We Cannot Afford to Make anything but the Best.



London Standard Drum Batch Mixer

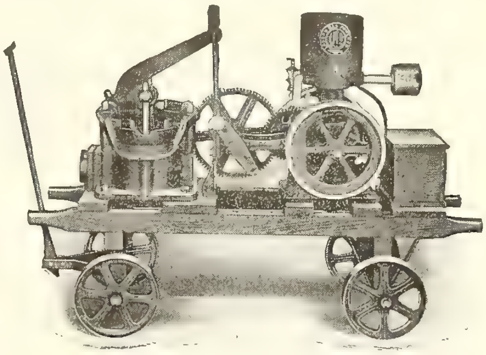
There are Large Profits in the manufacture of Cement Drain Tile.
Write for Particulars.

Over 600 London Concrete Mixers sold in Canada in Three Years.



Variety Woodworker

No Contractor can afford to be without a Variety Woodworker



Diaphram Pump with Power

We manufacture a complete line of Contractors' Machinery: Concrete Mixers, Hoisting Engines, All kinds of Pumps, Block Machines, Brick Machines, Tile Moulds, Derricks, Cars, Ornamental Moulds, Wheel Barrows, Carts, Scrapers and Cement Working Tools.

London Concrete Machinery Co., Limited

Head Office and Factory: Cabell St. and Kitchener Ave., London, Ont.

BRANCHES:

WINNIPEG (445 Main St.) W. H. Rosevear, Mgr.
CALGARY (622 9th Ave. W.) P. D. McLaren, Mgr.
TORONTO (60 Richmond St. E.) F. D. Emsley, Mgr.

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REGINA, H. A. Knight
FORT WILLIAM, Northern Eng. & Supply Co.
MONTREAL, Foss & Hill Mach. Co.
QUEBEC, A. D. Masson

We are the Largest Manufacturers of Concrete Machinery in Canada.

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McDougal Caledonian Iron Wks
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Canadian Allis-Chalmers, Limited.
Canadian Pipe Co.
Dominion Concrete Co.
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Munderloh & Co.
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Pacific Coast Pipe Co.
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Canadian Allis-Chalmers, Limited.
Waterous Engine Works.

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Waterous Engine Works Co.
Mussens Limited.
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Wettlaufer Bros.

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Lecky & Collis.
George Anderson & Co.

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Hopkins & Co., F. H.
Lecky & Collis.
Mussens Limited.

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Linde British Refrigeration Co.

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Canada Wire & Iron Goods Co.
Greening Wire Co., B.
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Steel & Radiation Ltd.
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Shunk Plow Company

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Barber Asphalt Paving Co.
Bird & Son, F. W.
Can. H. W. Johns-Manville Co.
Canadian Mineral Rubber Co.
Metallic Roofing Company.
Noble, Clarence W.
Paterson Mfg. Co.

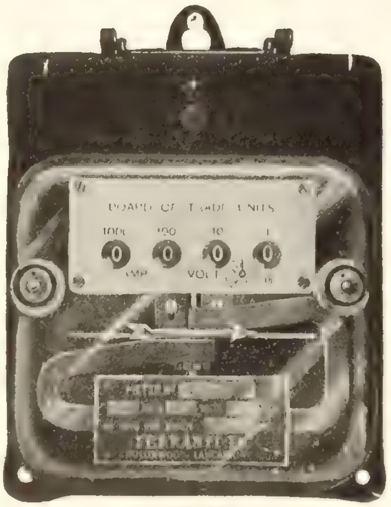
(Continued on page 14)

Ferranti Meters

Simplicity of construction.
Perfect accuracy.
Cyclometer or clock dials.
Top or bottom connections.
Prompt deliveries.
Every meter carefully inspected before shipment.
Absolutely guaranteed.

Send us your probable meter requirements and let us make you a proposition.

Large stock and fully equipped repair and erection Shops at Toronto and Winnipeg.



Glass Case—Top Connections

Steel Case—Top or Bottom Connections

The Ferranti Electrical Co., of Canada, Limited
TORONTO
90 Sherbourne St.
WINNIPEG
56 Albert St.

County Academy, Sydney, N. S. Built of Sydney Pressed Brick

Our plant is the only one of its kind in Canada making pressed brick from blast furnace slag. Brick made from this material is hard as flint—hardens with age and adheres with great strength to mortar.

Prices and Particulars on Request

Sydney Pressed Brick Co.
Limited
Sydney, Nova Scotia

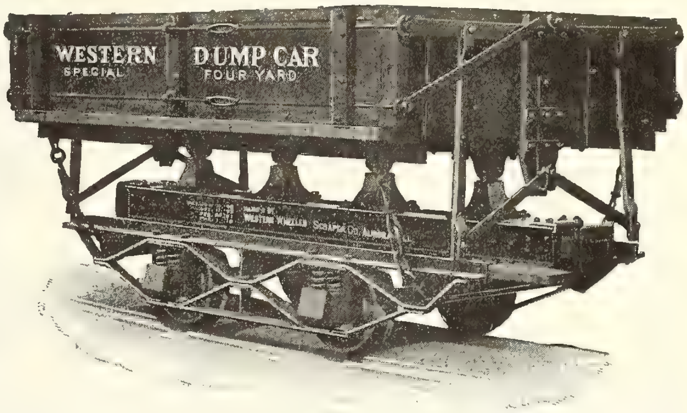
WESTERN DUMP CARS

can be dumped and righted by fewer men and in less time than required for the same operation on many other cars

Prominent Contractors have made the above statement time and time again, and its a proven fact. Just think of the saving. Western Air Dump Cars are used by many of the largest Railroads and at the Panama Canal. There must be many reasons.

Let us tell you them.

WESTERN WHEELED SCRAPER CO.
AURORA, ILLINOIS
Earth and Stone Handling Machinery
Dominion Supply & Equipment Co., Winnipeg-Calgary-Edmonton—Agents for Manitoba, Saskatchewan & Alberta
E. P. Jamison & Company, Ltd., Vancouver
Agents for British Columbia



Hagersville Crushed Stone

The Toughest Stone for Macadam in Ontario

Record of Logan Avenue, Toronto, Macadamized from Queen St. to Gerrard St., in 1902

Length 2,454 Lin. Ft. Width 24 Lin. Ft. 6,550 Sq. Yds.

COST FOR REPAIRS

1903	$ 0.00	1908	$ 93.26
1904	3.30	1909	200.46
1905	9.35	1910	14.07
1906	37.33	1911	2.29
1907	16.11		

Total $376.17 or 5⅔c. per sq. yd. for repairs for nine years, a little over 6-10 of 1c. per sq. yd. per year.

Why Not Use Hagersville Stone and Get These Results?

Hagersville Contracting Co.
Hagersville, Ont. Limited

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  - Sand and Supplies Limited.
  - York Sand and Gravel Co.
  - Alfred Rogers Limited.
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  - Shunk Plow Company.
- **Screens**
  - Canada Wire & Iron Goods Co.
  - Greening Wire Mfg. Co., B.
- **Sewer Joint Asphalt**
  - Canadian Mineral Rubber Co.
- **Sewer Pipe**
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  - Canada Iron Corporation.
  - Dominion Sewer Pipe Co.
  - Gartshore Thomson Pipe Co.
  - Joy & Son.
  - National Iron Works.
  - Ontario Lime Co., Ltd.
  - Ontario Sewer Pipe Co.
  - Smyth & Ryan.
  - Standard Clay Products Ltd.
  - Nova Scotia Clay Works Ltd.
- **Sewer Trenching**
  - Lecky & Collis
- **Sound Deadening**
  - Cabot Inc., Samuel.
- **Shovels (Steam)**
  - Browning Engineering Co.
  - Beatty & Sons, M.
  - Canadian Allis-Chalmers, Limited.
  - Hopkins & Co., F. H.
  - Montreal Locomotive Works.
  - Mussens Limited.
  - Thew Automatic Shovel Co.
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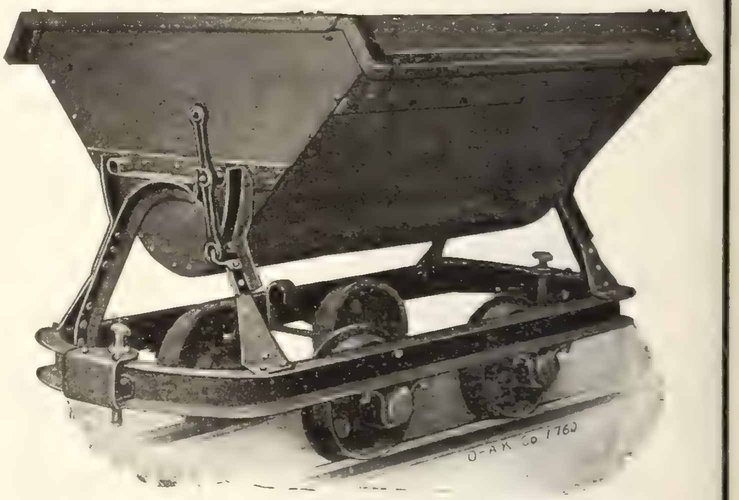

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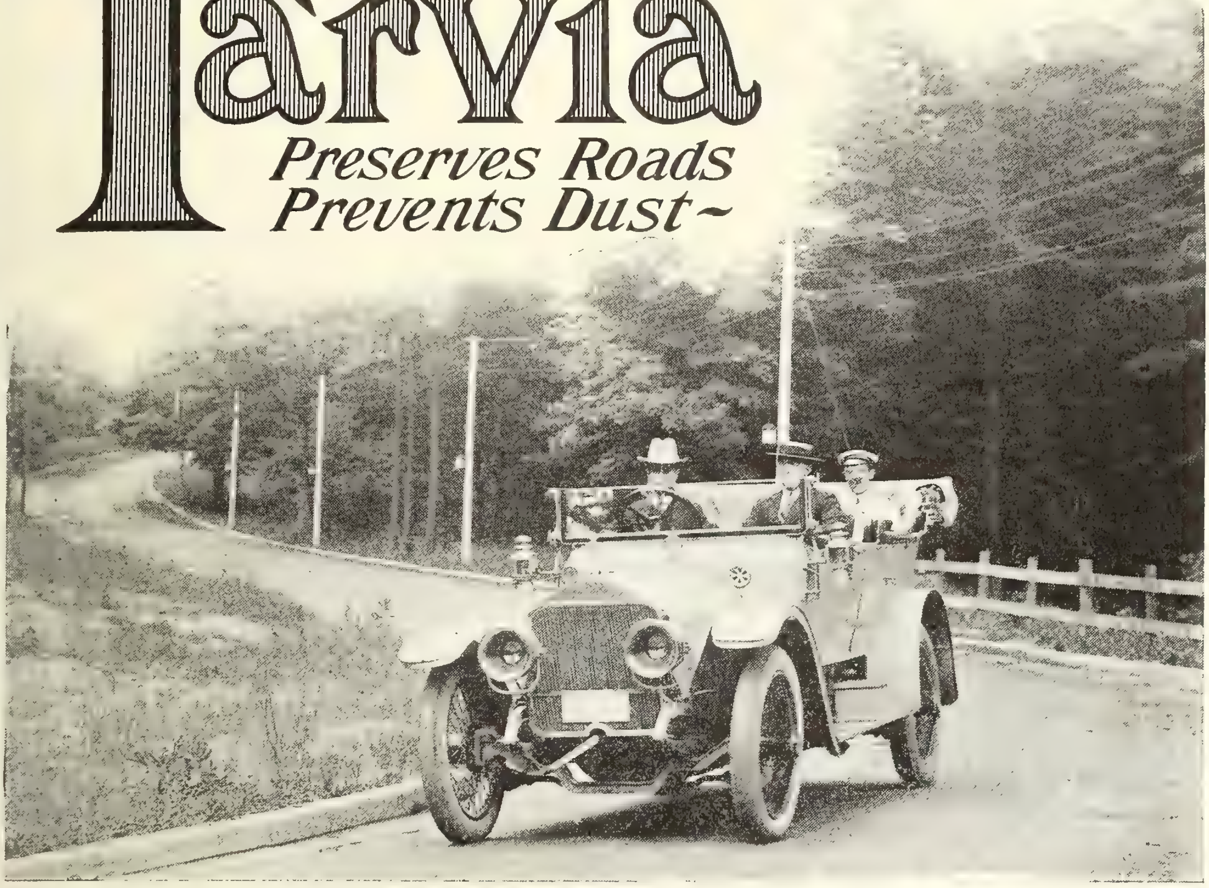

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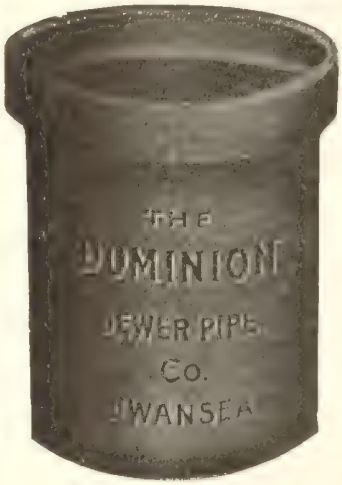

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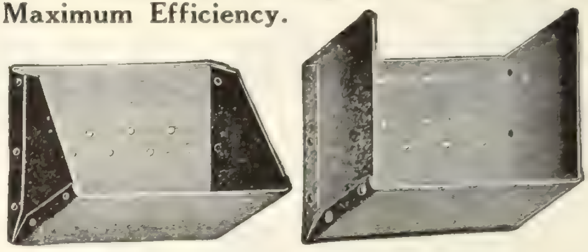

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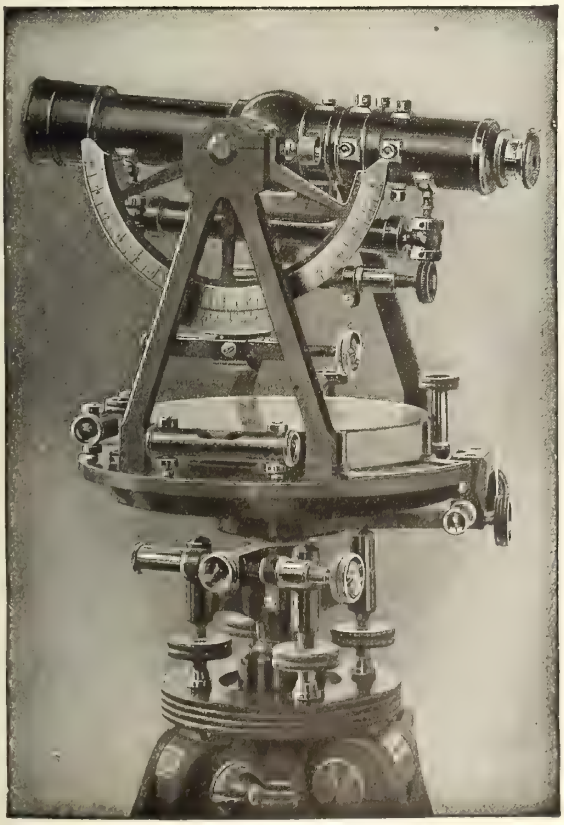

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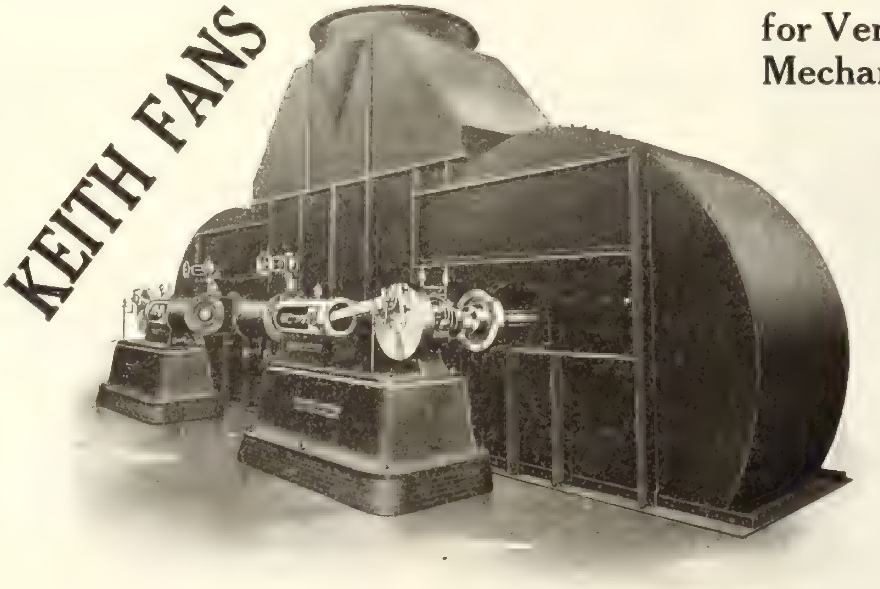

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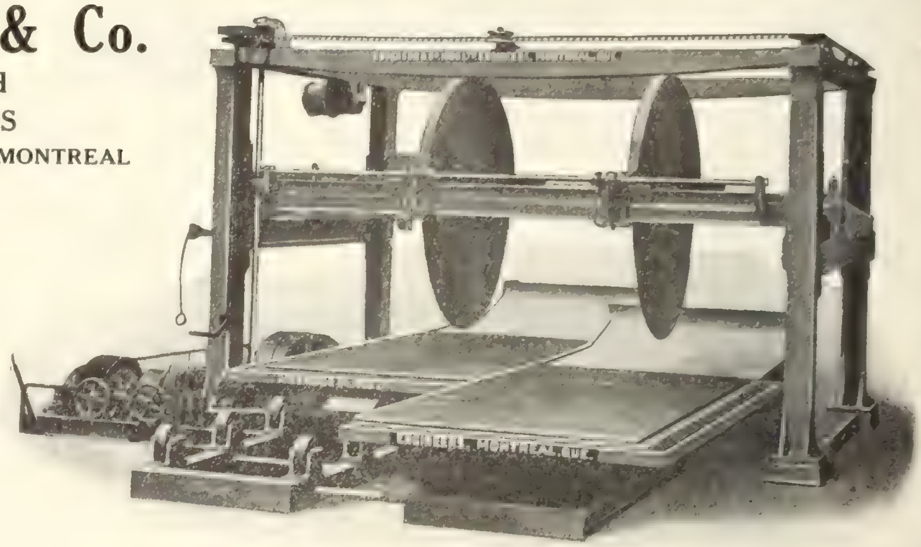

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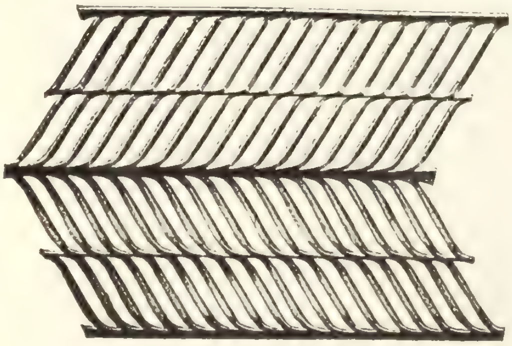

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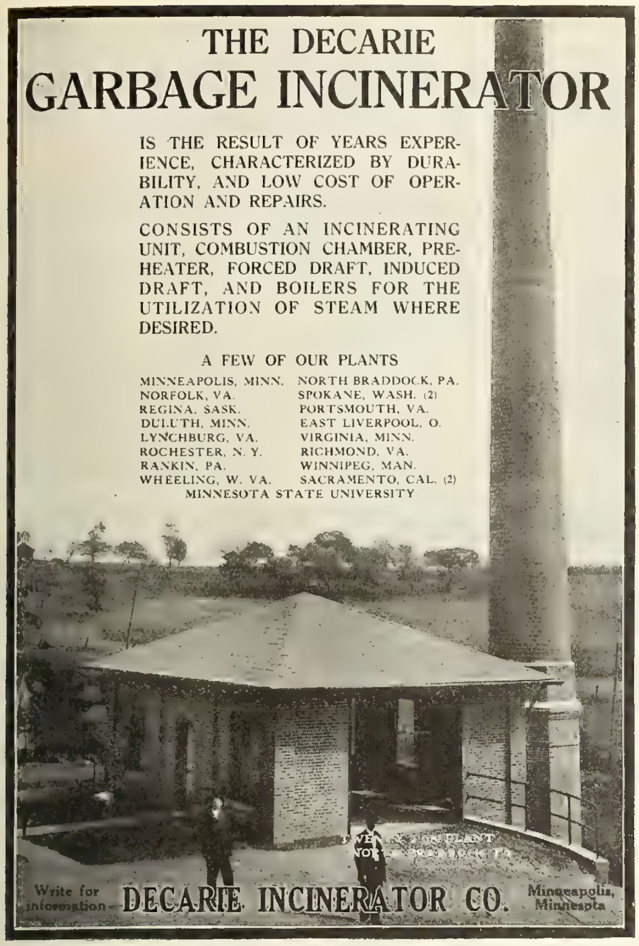

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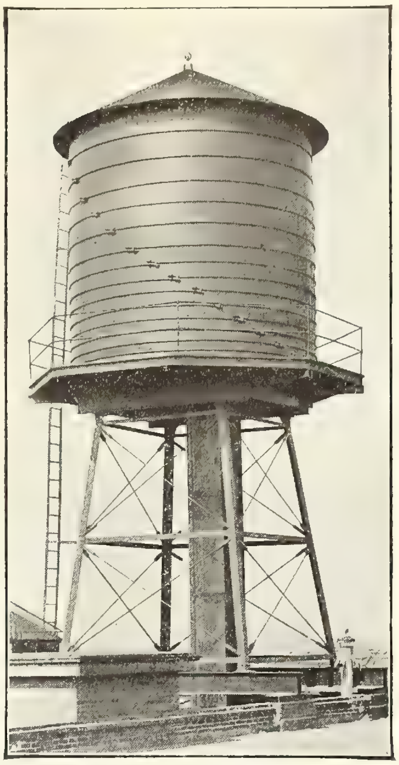

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SECOND HAND
BOILERS

We have a few exceptionally good second hand horizontal tubular boilers in stock, which we are offering at very attractive prices.

Some of them are practically new, and they are all in good order, and if you want a second hand boiler, this is a particularly good opportunity for you.

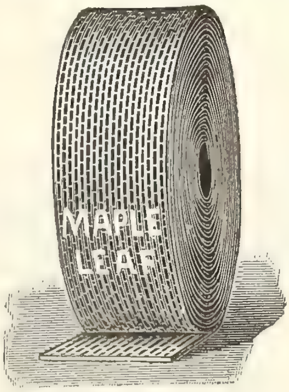
Shall we send you particulars?

William Hamilton Company
Peterborough, Ontario

Looking for the "Maple Leaf"

Has Become a Habit with Superintendents and Engineers.

The reason is not hard to find, for there is no part of your Belting system, from the main drive to the smallest light Belt for power transmission, where you will not get the best kinds of service from



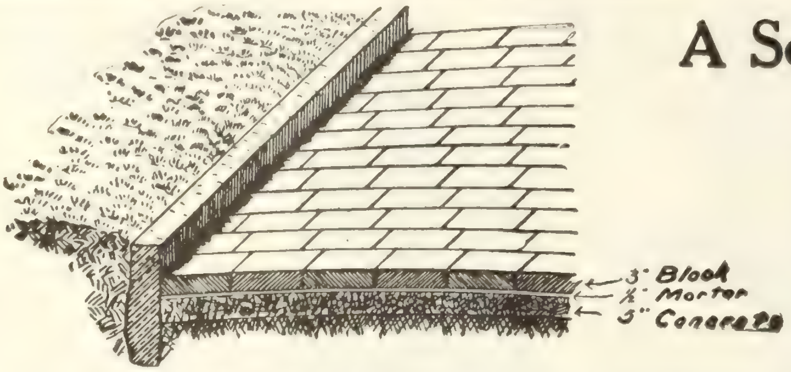
"Maple Leaf" Brand Stitched Cotton Duck Belting.

It is the most economical Belting because it is durable under every condition; even where other Belting will deteriorate rapidly. It is water proof.

It runs absolutely true on the Pulleys.
It is built of plies of selected duck.

Write for Information and Prices.

DOMINION BELTING CO., LTD.
Hamilton, Canada



A Scientific Pavement

must be

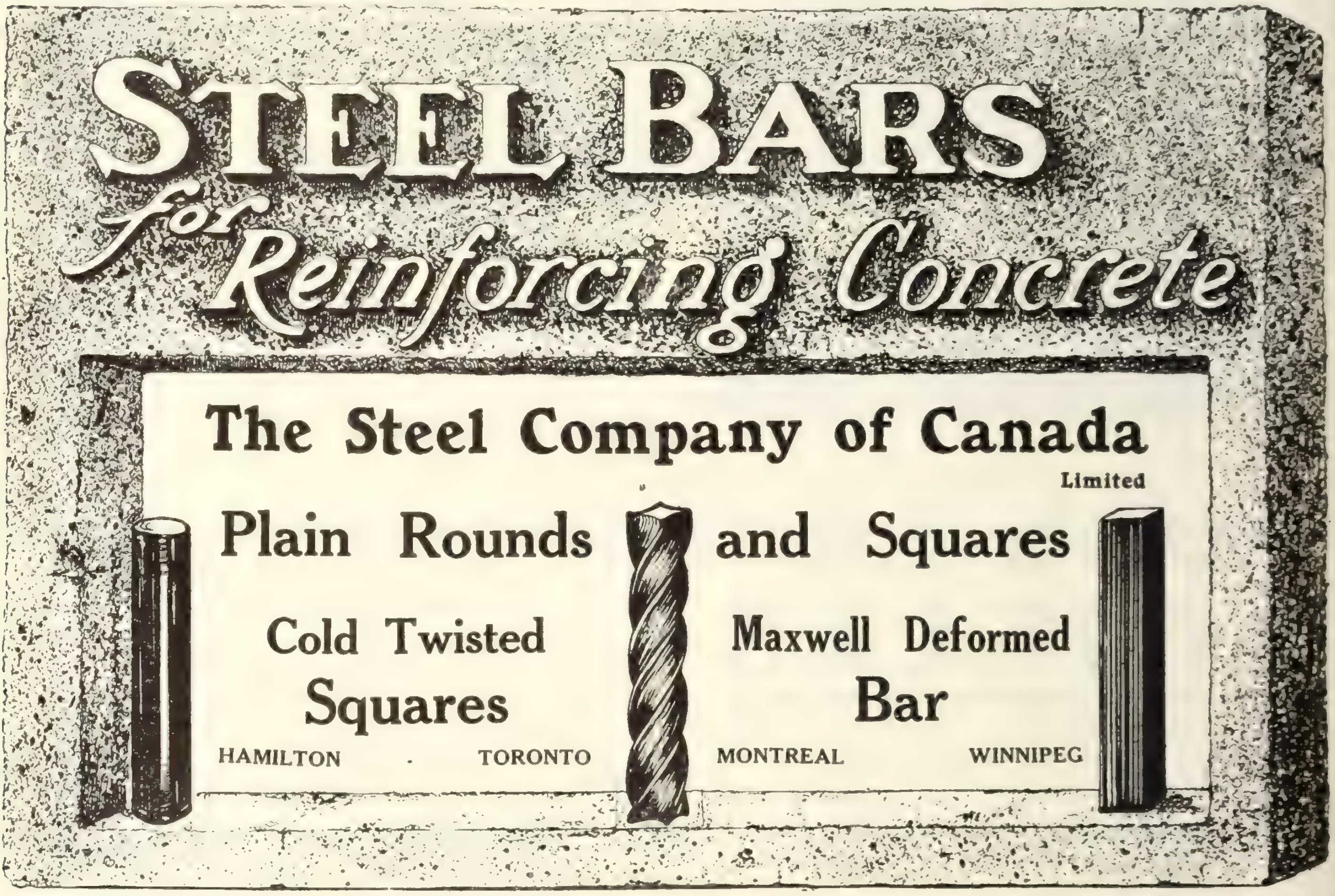
Durable and Non-Abrasive.
Non-Absorbent and nearly Noiseless.
Unaffected by extremes of Temperature.
Sightly and Sanitary.
Easily Repaired and easily Cleaned.

These requirements are met by

Asphalt Block Pavements

Send for Descriptive Literature

The Ontario Asphalt Block Company, Limited - Windsor, Ont.



STEEL BARS for Reinforcing Concrete

The Steel Company of Canada
Limited

Plain Rounds and Squares

Cold Twisted Squares

Maxwell Deformed Bar

HAMILTON - TORONTO
MONTREAL WINNIPEG

Dominion Steel Castings Company, Limited

Annual Capacity 12,000 Tons

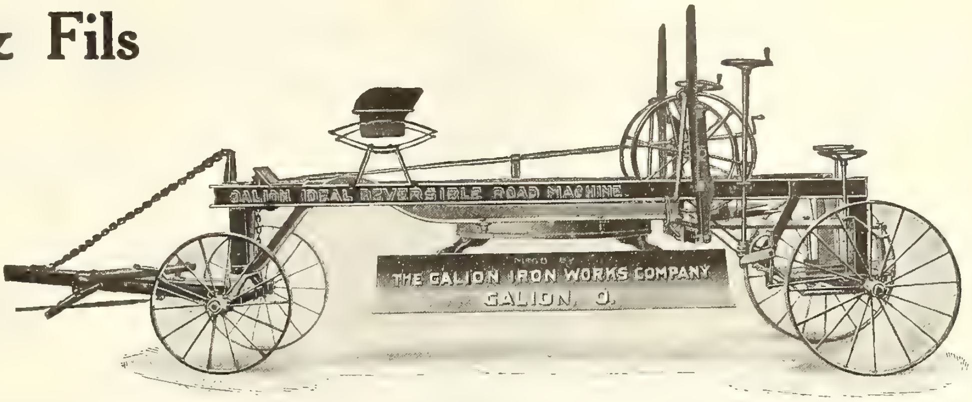
Stock Process for Small Work
Acid Open Hearth for Heavy
Machinery Castings

Hamilton, Ontario

J. B. Dore & Fils

Road Graders, Rock Crushers, Portable Engines, Steam Road Rollers, Sprinklers etc.

362 Craig St. West, Montreal
and Laprarie, Que.


GALION IDEAL REVERSIBLE ROAD MACHINE
MADE BY
THE GALION IRON WORKS COMPANY
GALION, O.

CANADA STEEL Co
LIMITED
HAMILTON CANADA

STEEL

For Reinforcing Concrete
Plain Rounds Squares
Twisted Squares
Cross Arm Braces, Plain and Galvanized.

We can ship from stock

Ask for prices—they will interest you.

STEEL

Angles from 3/4 x 3/4 in. up to 2 x 2 ins.
Round and square from 3/8 in. up to 1 1/4 ins.
Flats from 3/4 in. up to 4 ins. in width, and other special sections.

Office and Works:
Sherman Avenue, North

for Highest Efficiency, Absolute Reliability, Greatest Economy

Used by the Largest Mining Companies and Hydro-Electric Plants.
Also Extensively for Dredging, Exhaust Steam, Compressed Air, etc.

Sizes 3 to 42" Diameter up to 1/4" in thickness

Easily installed and securely connected with our Forged Steel Flanges or All Steel Bolted Joints.

Write for our Catalogue 5-A and prices on your requirements

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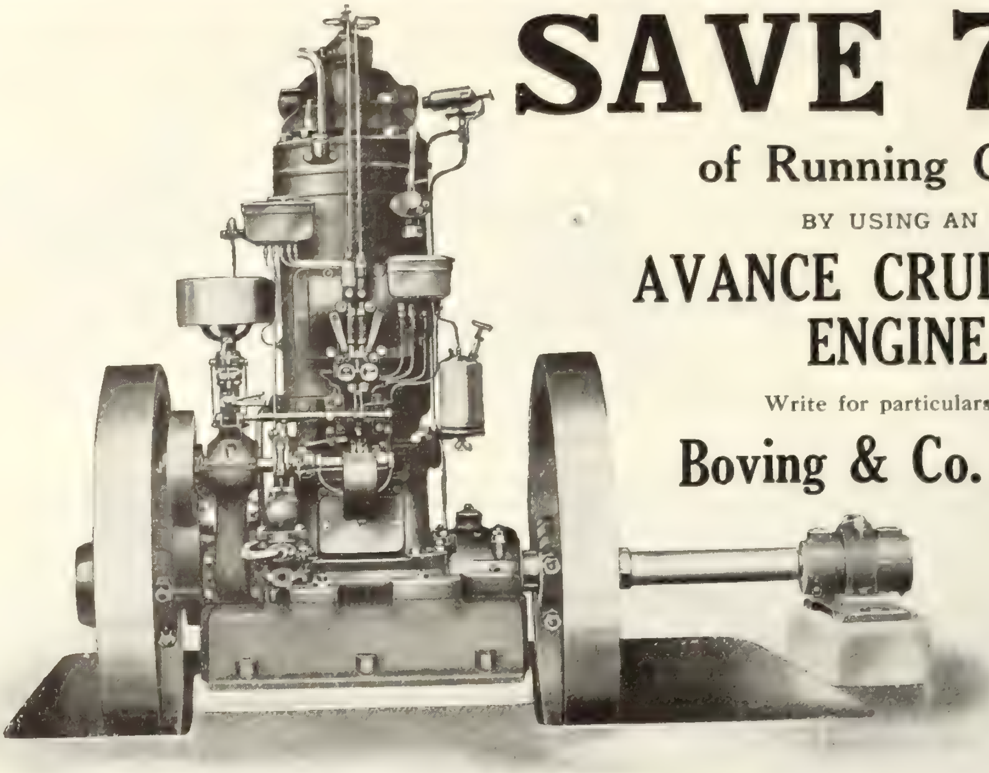

SAVE 75%

of Running Cost

BY USING AN

AVANCE CRUDE OIL ENGINE

Write for particulars to

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Engines
for
all
Purposes

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448 Seymour St.

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JOHN BAKER, JR.

ASPHALT

BITUMINOUS PRODUCTS
ROAD OIL

Representatives Throughout United States and Canada

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TRIANGLE MESH
CONCRETE REINFORCEMENT

Due to our increased capacity we can ship carload quantities in about two weeks from receipt order and full details at mill.

CAPITOL BUILDING, EDMONTON, ALBERTA
Reinforced with Triangle Mesh.

United States Steel Products Co., **30 Church Street, New York**

Exporters of the Products of American Steel and Wire Company

Canadian Offices
United States Steel Products Co. - - Bank of Ottawa Building, Montreal
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For Engineers' Handbook and full details regarding Prices and LOCAL STOCK ON HAND, address any of above offices

CONCRETE WATER-PROOFING

The Highest Authority on This Subject

Send your Business Card for the Toxement Booklet, 1913 Edition

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Gandy & Allison, St. John, N.B.
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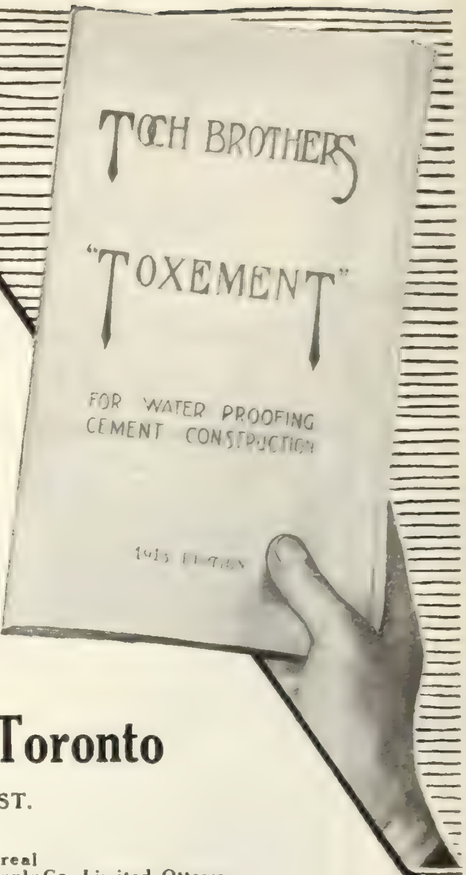


6500 TONS OF STEEL IN STOCK

Shapes — of all kinds, **Beams, Angles, Channels, Tees, etc.,** also plates, bars, rods checker plates, etc., in many sizes, weights and lengths, on hand.

Enquiries We will be pleased to have your specifications and enquiries, which will have our prompt attention. No inquiry too small to figure on.

Fabrication We are in good shape now to handle "rush work" and with our three large plants can give you good results.

Rush Orders For fabricated material required in a hurry we can quote you close prices for getting out "extra rush" orders.

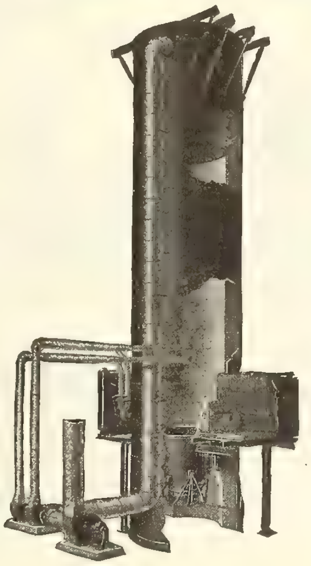
PROMPT SHIPMENTS GUARANTEED

The Hamilton Bridge Works Co. Limited

Established 1872

Hamilton, Canada

Economy in Lime Burning



Complete lime burning plants installed, securing the highest economy not only in the burning of the lime but also in quarrying the rock and delivering it to the kiln.

This service assures our customers of obtaining highest equipment value, lowest production costs and maximum output of lime of the highest grade.

We are the only company offering this service with the security it affords the buyer.

Doherty-Eldred Lime Kilns are the key to quality and economy in the actual lime burning.

WRITE FOR BULLETIN NO. 4.

The Improved Equipment Company

Executive and Sales Offices: 60 Wall Street, NEW YORK

COMBUSTION ENGINEERS

Muffle Furnaces	Gas Producers
Complete Gas Plants	Special Industrial Furnaces
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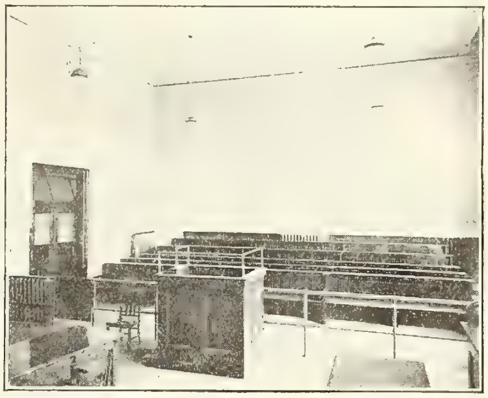

Court Room, Moose Jaw, Sask. after J-M Acoustical Treatment

CORRECTION OF ACOUSTICS

Scientific research has at last overcome the problems of architectural acoustics. The important laws governing the internal acoustics of court rooms, etc., are now known. Knowledge of the laws means knowledge of the proper correction to be employed. Having made a study of these laws and the technique of their application, we are in a position to guarantee results. We have made many notable installations all over the country, one of which is shown in the accompanying cut.

Write nearest branch for full particulars

THE CANADIAN H. W. JOHNS-MANVILLE CO., Ltd.

Manufacturers of Asbestos and Magnesia Products

ASBESTOS

Asbestos Roofings, Packings, Electrical Supplies, Etc.

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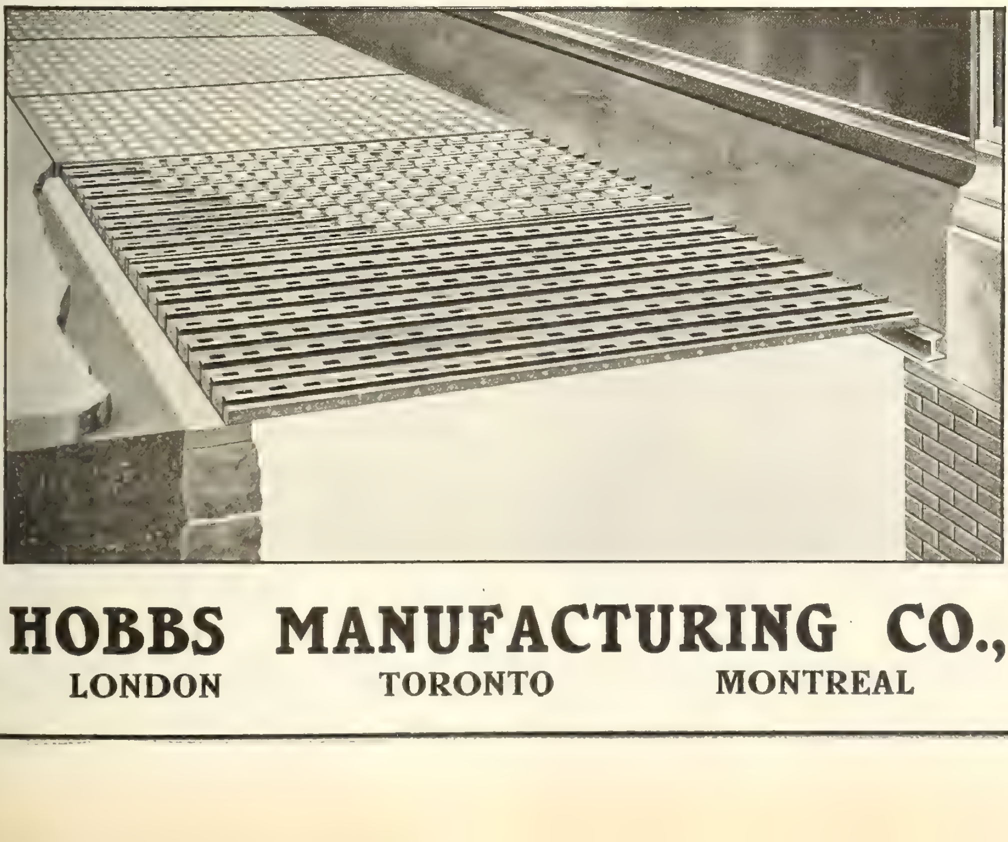
1729

Simplex Double Reinforced Vault Light Construction



We guarantee this construction to be free from leakage and shaling of the glass.

Sole Canadian Agents and Manufacturers of

SIMPLEX
NU-PLAN
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PRISM CONSTRUCTION

HOBBS MANUFACTURING CO., LIMITED

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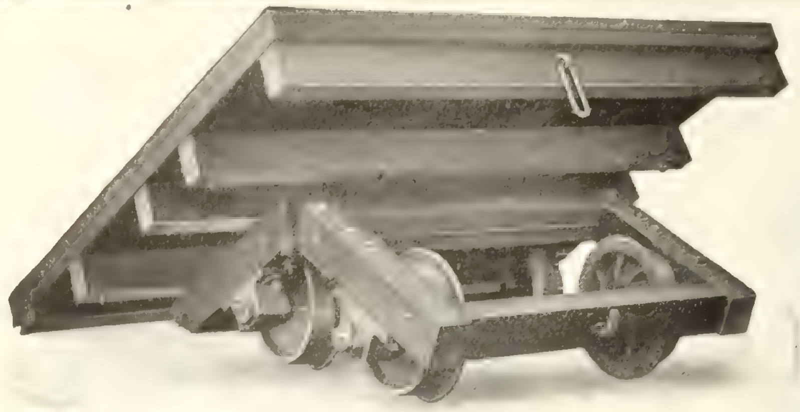


Showing "GRASSHOPPER" End Dump Rock Car in dumping position.

GLENGARRY

Equipment is used on all the Largest Contracts

Grasshopper End Dump Rock Cars

The features which have been so much admired in these cars is their entire simplicity, strength and quick working qualities. They are used for handling boulders and blasted rock in cuts and elsewhere and being low down they load quickly. Note quick dumping action.. By using our extra side boards they can be used for loose earth also and make a cheap end dump car of 1½ yards capacity. Gauges 30 and 36. We sell them complete, or without platforms, or with frames only.

Manufactured Exclusively by

The Schell Foundry & Machine Company, Limited

Write for prices. Alexandria - - Ontario *Send for photographs.*

Save Time, Trouble and Money

By Using a

THEW SHOVEL

for that EXCAVATING CONTRACT

The contractor with men and teams cannot compete successfully with the man who owns a THEW SHOVEL.

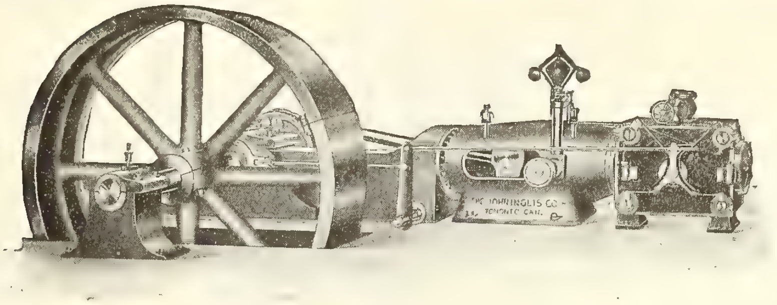
THE REASON WHY

The smallest Thew does the work of from twenty to forty men at one-third of the cost. The Thew, being able to load a wagon a minute, will often save enough in team time to pay its entire operating cost, which means that you are loading dirt for practically nothing. Hand labor is difficult to secure, hard to hold and inefficient in practice, while the Thew is always on the job.

It will pay you to investigate this shovel. Write for our catalog, C. R. It will explain the numerous features which make the Thew the most practical and economical machine of its kind on the market and will give you valuable information regarding cost of excavating.

The Thew Automatic Shovel Company, Lorain, Ohio

CORLISS ENGINES

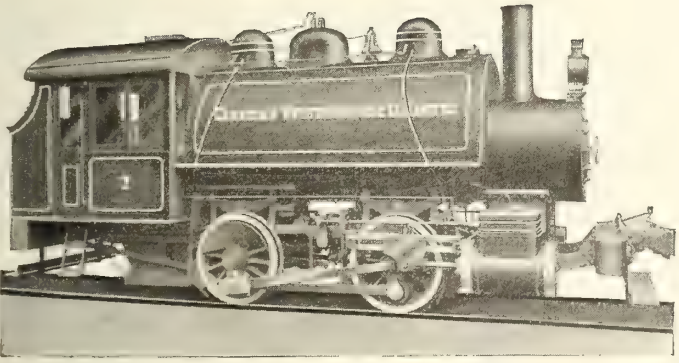


THE value of Experience in the manufacture of "Inglis" Engines is emphasized by the ever increasing demand for our product.

Write us for particulars

The John Inglis Company, Ltd., 14 Strachan Avenue,
Toronto, Canada
ENGINEERS AND BOILER MAKERS

BUILT FROM EXPERIENCE



Locomotives on trunk line railroads have the advantage of the best facilities for inspection and repairs.

Contractor's locomotives face different conditions. They must work day after day in the hardest service, and often in localities where repairs cannot be made without great inconvenience.

When you want a locomotive you cannot afford to overlook the experience of this company.

Experience in building large locomotives is invaluable in connection with the design of smaller ones in order to insure reliability, which is the main question in contracting work. You know what delays cost you.

MONTREAL LOCOMOTIVE WORKS, LTD.
DOMINION EXPRESS BUILDING, MONTREAL, CANADA

Concrete Tampers

for all kinds of concrete work

Made with strong cast iron bases in following sizes:

6" x 6"—8" x 8"—10" x 10"

and can be supplied with wood or gas pipe handles.

Our prices are lower than can be procured elsewhere and we can supply them in lots of one dozen or by the carload.

Made in correct shapes and are strong and durable.

Let us quote you prices.

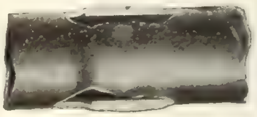
Canadian-Warren Axe & Tool Co.
St. Catharines, Ont. Limited

If you write

"Interlock Welded Necks and Atwood Line Welds"

into your piping specifications, you avoid three-fourths of your joint troubles. The **Interlock Welded Neck** eliminates the use of cast fittings for branch lines. The **Atwood Line Weld** permits the fabrication of pipe into maximum shipping lengths with a consequent reduction of line joints. Both are our patents. Each is as strong as the pipe itself.

**PITTSBURGH VALVE,
FOUNDRY & CONSTRUCTION COMPANY**
Pittsburgh, Pa.



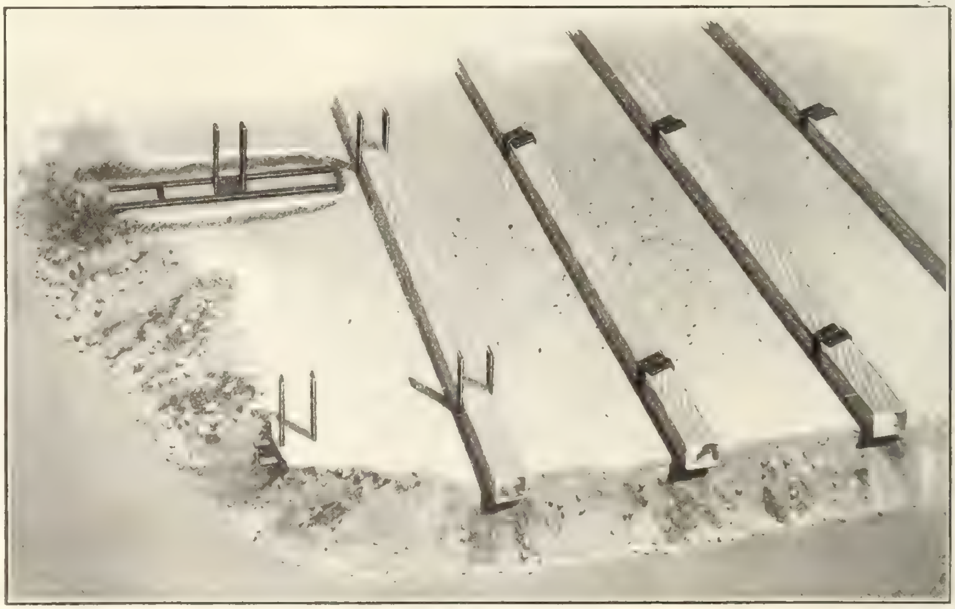
GRIP TIGHT FLOOR SLEEPER ANCHOR

SAVES TIME

Eliminates necessity of cinder fill, with proportionate *saving in floor loads.*

Prevents rot in wooden sleepers and floors.

VALUABLE AIR SPACE SECURED



SAVES MONEY

Prevents shrinkage in wooden sleepers and floors.

Saves expense of bevelling sleepers.

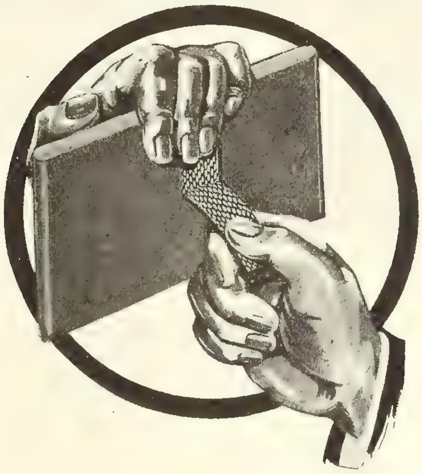
SPACES SLEEPERS AUTOMATICALLY.

The Grip Tight Anchor Strip is supplied in 8 ft. lengths and 2 inches in width, with pairs of prongs to hold sleepers at 12, 16 and 24 inch centres. It can be readily puddled into the fresh concrete, to a sufficient depth to hold about 1½ inches. After concrete is dry, the prongs which protrude, may be bent over flat until such time as sleepers are to be laid, when they can be easily turned up and nailed.

Write for Descriptive Matter and Prices.

BLACK BUILDING SUPPLY CO., LTD., Sales Agents, Mail Bldg. **TORONTO**

GOODYEAR



Try pulling this Belt apart

That will give you some idea of the enormous strength built into Goodyear Belts. Not an ounce of untested rubber is used, not a roll of untested duck. Each finished Belt is inspected before shipping *to make sure* that it will stand the *wear* and keep *pliable*.

The Goodyear system of Belt making is calculated to give the greatest efficiency in practical Belt Service.

A close, clinging grip of the pulleys—absolutely non-slipping. Goodyear Rubber Belting gives this cohesive contact because of its yielding rubber surface, and the practical result is an immense saving of power.

Pliability under all conditions. A belt must be pliable to grip the pulleys. The hard cotton fibre of Goodyear Belting is permeated—under tremendous pressure—with rubber. The treated layers are compressed into an homogeneous mass. This preserves the pliability of rubber in the finished Belt.

Entire absence of "stretch." The "curing" or vulcanizing of Goodyear Belting is performed whilst the Belt is stretched to the limit of safety in a special machine. "Stretch" in service therefore is impossible. This means no stopping of machines for adjustment—no idle machines, no idle men.

Enormous strength. The union of carefully tested hard-fibre cotton with tenacious and elastic rubber "friction"—compressed to make the plies practically inseparable—gives a combination of prodigious strength. A Goodyear Rubber Belt is as nearly unbreakable as any Belt can be.

Long Life. The duck or fabric of Goodyear Belting cannot be reached by water, or anything else that would set up rot and destroy the Belt. A Goodyear Belt renders long and efficient service. 104

GOODYEAR

Rubber Belting

Factory Superintendents specify Goodyear Belting. They are satisfied that Goodyear Rubber Belting puts the plant on a power-saving basis Write for free Book on the choice of a belt.

The Goodyear Tire & Rubber Co. *of* Canada, Limited

Head Office: TORONTO

Branches at

Factory: Bowmanville, Ont.

Victoria Vancouver Edmonton Calgary Regina
Winnipeg Hamilton London Toronto Montreal St. John, N. B.

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Water, Plumbing and Gas Brass Goods

have made a reputation for quality that places them prominently in the foreground as the best known, the most serviceable, and the most durable Brass Goods on the market.

For over 56 years MUELLER Brass Goods have maintained a standard that has brought them to the very pinnacle of quality in the production of Brass Goods for Water Works, Plumbers, and Gas Companies. By quality we mean Brass Goods that give long and perfect service with practically no repairs; goods that are made of the very best quality Red Metal; and goods that are so constructed as to eliminate friction in working parts as far as possible to do so.

Some of the MUELLER Products

- Water and Gas Tapping Machines
- Water and Gas Service Boxes
- Corporation Cocks
- Water Connections
- Ground Key Work
- Compression Work
- Rapid Compression Work
- Fuller Work
- Self Closing Work
- Gas Cocks
- Service Clamps
- Supply Pipes
- Meter Testers
- Water Strainers
- Pressure Regulators
- Check Valves
- Waste and Overflows
- Soldering Nipples, etc.

All MUELLER Goods are UNCONDITIONALLY GUARANTEED

Every piece of goods bearing the MUELLER name carries with it an Unconditional Guarantee that our goods are absolutely free from any manufacturing defects, and means exactly what it says.

Always see that the name

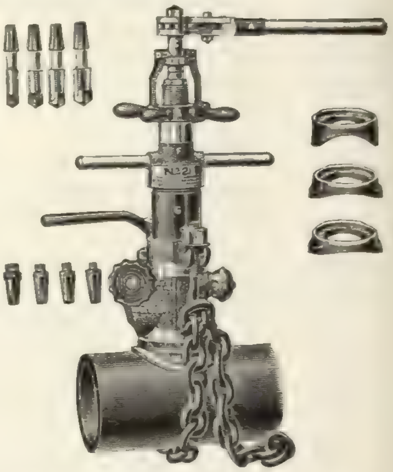
MUELLER

is on your brass goods. You cannot go wrong. Such a strong reputation as is back of MUELLER goods is well worth our protection and our assurance to you of the right goods.

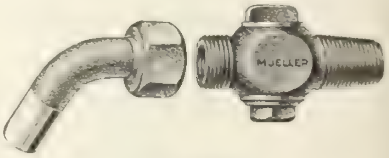
Have You a MUELLER Catalog Yet?

If not—you ought to have one immediately. To the left we have mentioned only a part of the products listed therein.

Will you write us today?



MUELLER No. 2 Machine



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H. MUELLER MFG. CO., Ltd.

SARNIA, ONTARIO

Decatur, Illinois New York City San Francisco Chicago

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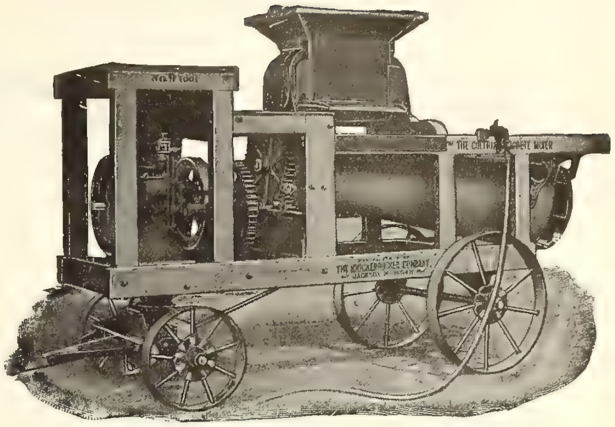


Coltrim Concrete Mixer
No. 9

The housing is removed to show the heavy gear drive. Note also the solid construction throughout. "BUILT TO LAST."

There it is Gentlemen!

The mixer that eliminates the wheelbarrow.
The mixer that will pour a continuous stream of perfectly mixed concrete—mixed in *absolutely accurate batches.*

And right here we want to say that if you are skeptical about the absolute accuracy of our mix, we want to send you a few of the actual letters we are receiving daily from contractors—municipal engineers and architects. They are from real, practical, money-making men. Send for the letters to-day—we'll send our Concrete Book with them.

THE KNICKERBOCKER CO., - JACKSON, Mich., U.S.A.

Nova Scotia Steel & Coal Company, Ltd.

Beg To Announce

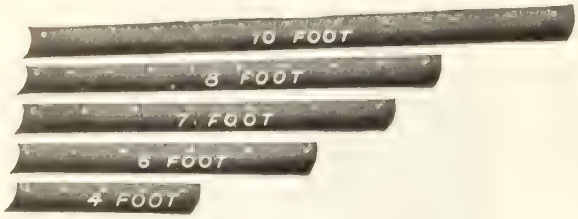
That their new steam-hydraulic forge shop is now in operation, as also is their recently installed "Harmet" fluid compression-plant.

These improvements bring "Scotia's" equipment abreast of the best foreign forges.

They are accordingly open to supply forgings of all shapes and sizes. Made of ordinary or fluid compressed open-hearth steel, and satisfying the most severe specifications.

For Prices and Particulars Apply to

Head Office - - New Glasgow, N. S.



We manufacture and carry in stock road plows, scraper blades and moldboards ½ inch thick and lighter, of the very highest quality of steel and workmanship, for all makes of road scrapers. Blades guaranteed to be of the very best quality. Write for prices, discounts and list No. 20.

THE
SHUNK PLOW COMPANY
BUCYRUS, OHIO

Canadian Agents Wanted

THE Underwood embodies in one machine all that can be expected in a typewriter. It is sold at the price which should be paid for a machine of its quality.

United Typewriter Co., Ltd.
All Canadian Cities

Jennings & Ross
Limited

Engineers and Contractors

Royal Bank Bldg. - Phone Adelaide 292
King and Spadina
Toronto

Kingston Road Sewer
Showing heavy timbering necessary owing to depth of excavation.

CAST IRON PIPE

for all services:—

Water and Gas Supply, Fire Protection, Road Culverts, Sewers, Drains, Exhaust Lines, etc.

Bell and Spigot - Flexible Joint
Flange Pipe - Plain End Pipe
Standard Fittings - Special Castings

Apply to Nearest Office

United States Cast Iron Pipe and Foundry Co.

General Offices:—BURLINGTON, NEW JERSEY

Branch Offices:—PHILADELPHIA, NEW YORK, CHICAGO, ST. LOUIS, SAN FRANCISCO, PORTLAND (Ore.) BUFFALO, PITTSBURGH, CHATTANOOGA

Test of Philadelphia Fire Lines

John T. Hepburn

18 to 60 Van Horne St.,
TORONTO, CANADA

We build all kinds of Cranes for

HAND POWER
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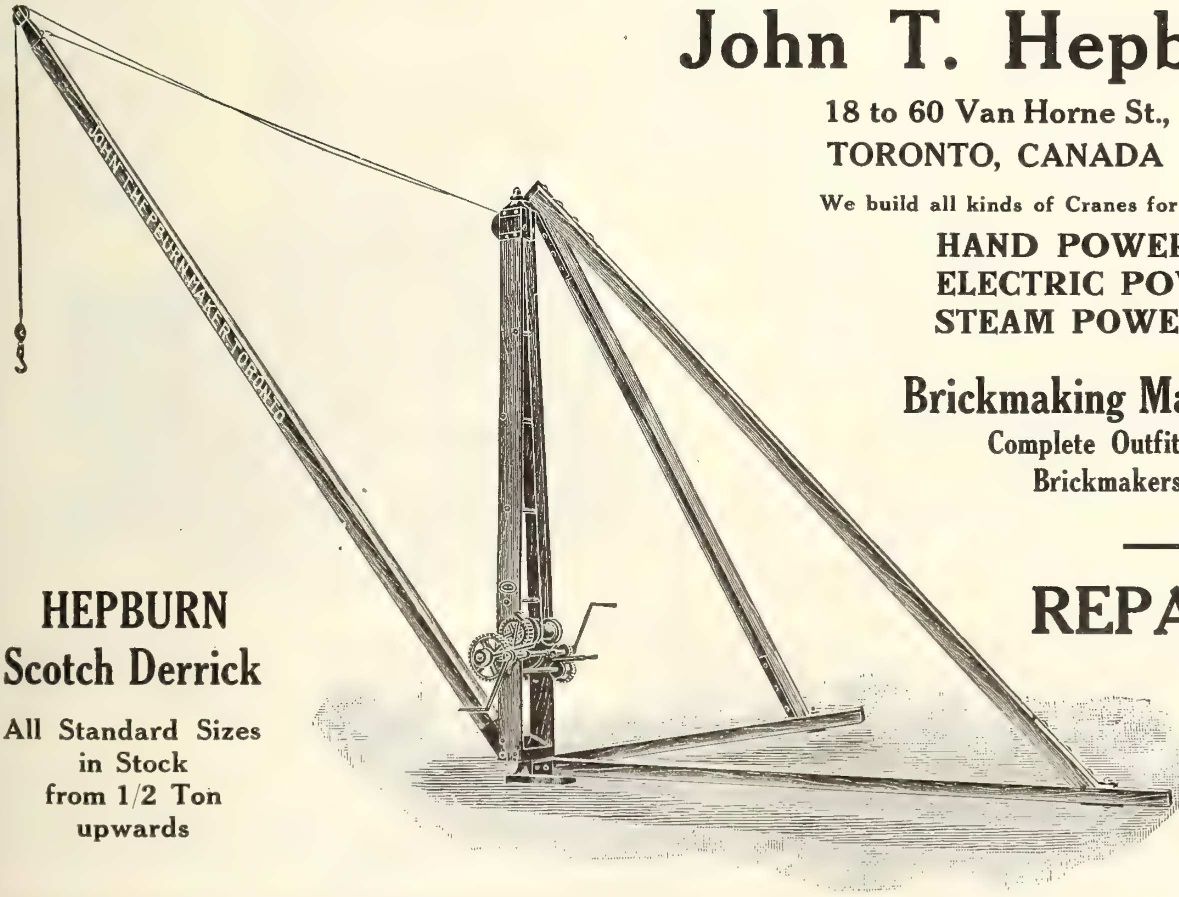
Brickmaking Machinery

Complete Outfits for Brickmakers

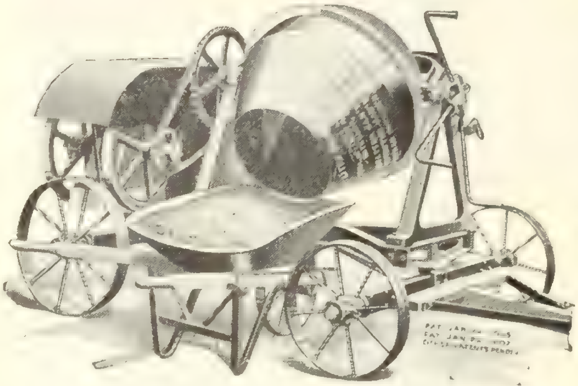
REPAIRS


JOHN T. HEPBURN MAKER TORONTO

HEPBURN Scotch Derrick

All Standard Sizes
in Stock
from 1/2 Ton
upwards

Grasp this Idea



Little Wonder "Five" without Side Loader

You have to make money faster these days than ever before. You must do it by making time.

SPEED, EFFICIENCY, UTILITY--these are the keys to success. These are the winning features in WONDER Concrete Mixers. Not to know the machines is to be behind the times. Not to take advantage of them is to neglect a real opportunity.

LITTLE WONDER "FIVE"

"The Small Job Money-Maker"

THE WONDER "TEN"

"The Big Job Money-Saver"

THE LITTLE WONDER "FIVE" is the swiftest, simplest, strongest mixer ever known for building sidewalks, curbs, drives, foundations, etc. Saves 50 cts. per cu. yd. over hand mixing and pays for itself in a few days by its profits. Capacity 5 cu. ft. per batch. Mixes 35 to 50 cu. yds. per day. Side Loader practically doubles this capacity with only small extra investment. Endorsed by thousands of contractors all over the country.

The WONDER "TEN" is a 1-3 yd. "Sack to the Batch" mixer for **heavy work.** It will do the work of machines costing two or three times the price and make twice the money by its speed and greater utility. Embodies the same unique features that have made the LITTLE WONDER "FIVE" the fastest seller in the history of the concrete business.

Wonder "Ten" with Side Loader

TEN DAYS' FREE TRIAL

We will send you either size of the WONDER, with or without Side Loader, for Ten Days' Free Trial on your own work. If you're not fully satisfied with the machine in every particular, notify us within the ten days and we will tell you where to ship it and refund the freight you have paid. You are under no obligations whatever.

All we ask is to show you. Write TODAY

WATERLOO CEMENT MACH'Y CORP'N

117 Vinton St., WATERLOO, IOWA, U.S.A.

Mfrs. Concrete Mixers, Builders' Hoists, Elevators and Cement Tools

CANADIAN REPRESENTATIVES:—Waterloo Cement Mach'y Corp'n, 127 Coristine Building, Montreal, Que.; General Mach'y Co., 22 Mulock Ave., Toronto, Ont.; J. W. Anderson, 3 Bank St. Chambers, Ottawa, Ont.; J. A. McTaggart & Co., Winnipeg, Man.; Strumbert, Virtue & Co., 319 Pender St., Vancouver, B.C.

MORRIS
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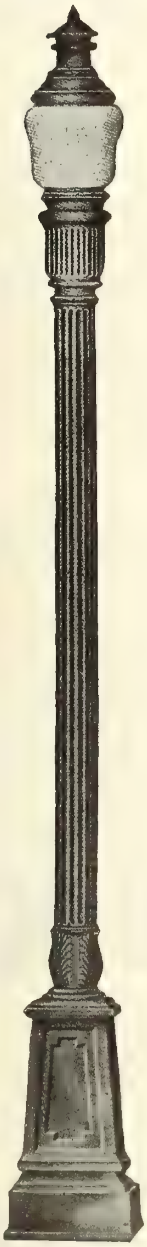

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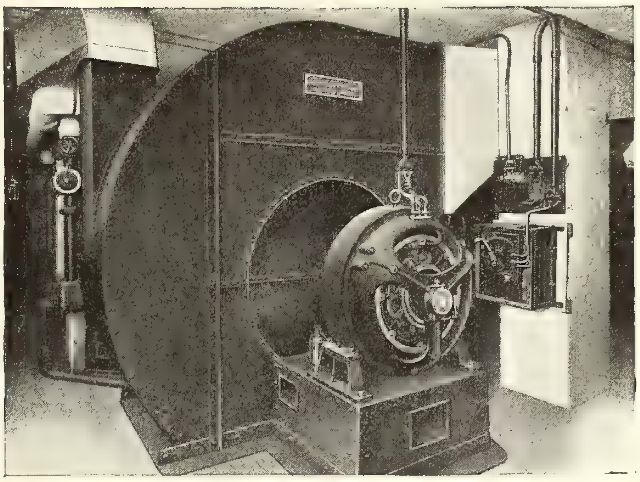

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Diagrams vs. Pictorial Reproductions in the Illustration of Technical Articles

ONE of our contemporaries criticises with some point the over-estimated value that many contributors to the technical press place upon "pictorial reproductions." In a day when practically every engineer and contractor of any importance consider it a part of their business to prepare an occasional description of their work for the technical journal, the subject is worthy of more than passing notice.

Undoubtedly, a great deal of time and space have been wasted in the preparation and publication of photographs which by right should find no other place than the souvenir scrap-book of those intimately connected with the work. As a general rule, photos of the exterior of buildings, bridges and sewer work, for instance, convey little to the average reader, who is far more likely to appreciate the illustrated explanation of details of special interest. The writer of the article cannot exercise too much care in this particular. He must make allowance for the fact that his particular knowledge of the work enables him to find far more interest in a photograph of a general character than the reader. We make no apologies for enlarging upon the point to the extent of giving our readers some definite instructions upon drawings for reproduction.

Size is the first consideration, and the most frequent source of unsuitable reproductions. The drawing should be made considerably larger than it is intended finally to appear. The usual widths for illustrations are column and double column. In the case of this journal these measurements would be 3½ in. and 7 1-6 in. For large drawings with much detail a whole page is sometimes used. When several drawings are made on one sheet the question of the relative importance of the various items must not be overlooked.

Any good white paper is suitable, the smoother the better. Ruled paper of any sort is unsuitable, as the lines would appear. Drawings on tracing cloth or paper also give perfectly satisfactory results.

Nothing but Indian ink should be used. The use of coloured ink or ordinary writing ink renders the drawing unsuitable for the necessary photographic operations in preparing the block.

The actual drawing should be carefully executed in good bold lines, and the temptation to finish off small straight lines freehand must be resisted. There should be no confused mix-up of lines at any point, and any large expanse of shading should be left to the engraver.

Nothing is so neglected in most drawings as the printing. The lettering should be bold, and of a sufficient size to bear reduction without any sacrifice of clearness. Small marks, such as the ticks indicating feet and inches, are apt to disappear in the most annoying fashion, and the omission frequently mystifies the reader to an abnormal degree. The best type of letter is one that is bold and instantly translated.

With regard to photographs, these should be glossy prints whenever possible. Plenty of contrast is desirable, and a dull, flat print should be cast aside.

In the course of a year many articles reach us, and in the majority of cases the literary style is very creditable. Sad to relate, however, in the majority of cases, also, the value of the article is reduced to the minimum by unsuitable illustrations. Occasionally, very occasionally, the draughtsmanship is above reproach, but more often the editor is led to wonder whether his careful instructions to the effect that "drawings for reproduction should be in black and white and boldly lettered" have been taken as a joke. The progressive spirit of the age demands of the engineer the ability to describe his work faithfully, yet concisely, in black and white. As a matter of fact the preparation of such work induces care and accuracy and impresses upon the author the special experience that he has gained in the execution of that work. An article well written and carefully illustrated reflects the greatest credit upon the author, but it is otherwise when the reader turns to an illustration for reference and finds that it is next to impossible to make head or tail out of it. In such cases the editor gets a share of the blame—hence, to be candid, this article.

Profit and the Time Element

IF a hundred contractors were asked what their profits averaged, there would probably not be one reply in which the element of time would be mentioned, observes our Chicago contemporary, Engineering and Contracting, in an editorial article which we commend to our readers. Contractors ordinarily indicate profits as a percentage of the cost or of the bidding price. Thus, a contractor will say: "My profit averages 10 per cent." If a man is asked what his salary is, he will give the answer in dollars per week, or other unit of time. And a little consideration shows that profits should also be expressed in terms of some unit of time.

If we exclude the insurance against risk that forms part of most profit, the profit of a contractor is, in reality, his wage. It is the difference between the price bid and the cost. The cost should always include interest on the capital invested. Since profit is a wage it should be expressed in terms of time. A contractor should say: "My profit averages 10 per cent. on a $100,000 worth of work done each year." Merely to say that a profit was 10 per cent. on a $100,000 job is vague information, for the job may have lasted six months or it may have stretched out over two years.

One of the fundamental rules of commercial management may be expressed thus:

So conduct the business that a maximum profit per annum will result.

The time unit in this rule is vital. It would not be correct to say that the object is to secure a maximum percentage of profit, for that gives neither a statement of the time devoted to the work nor the gross amount of the work.

The general contractor who takes three jobs of $100,000 each, sublets them, and finishes within a year at a 5 per cent. profit, makes $15,000 net. The contractor who takes a year to one $100,000 job, and does it himself at 10 per cent. profit, makes $10,000 net. The advantage of subcontracting to reliable men consists not merely in the greater certainty of securing energetic superintendence, but in the ability to handle a larger volume of work in a given time. This latter point is one that is repeatedly overlooked by many a contractor. In his desire to make, say, 15 per cent. profit, a contractor, will frequently sublet nothing, work only his own outfit, and carry the work along at a slow pace in consequence. Perhaps he does make the 15 per cent., but takes 18 months to do a relatively small volume of work, so that he earns a smaller annual income than his neighbor who sublets most of his work and makes 5 per cent. on a large volume each season.

Subcontractors, it should be remembered, have capital employed in their work. By enlisting the aid of this capital, a general contfactor is able to carry a larger amount of construction at one time than would otherwise be possible.

But even where subletting is not practised, work should be planned with the time element prominently in view. Suppose, for example, a contract for 200,000 cu. yds. of earth is involved, and that it can be handled with a given outfit in six months at a profit of 10 per cent. This would mean 1.67 per cent. profit per month. By increasing the size of the outfit, the cost of moving the plant to and from the job would increase the fixed costs and reduce the percentage of profit, let us say, to 8 per cent. But if the time were reduced to 4 months, the profit would become 2 per cent. per month instead of 1.67 per cent. per month. Therefore it would ordinarily pay to do the work quicker and secure a less total percentage of profit if a greater monthly percentage of profit could be earned. In this way a contractor's plant and cash capital are freed sooner for other work, resulting in a greater total annual profit than would otherwise be secured.

Incidentally, we may add, there are other advantages that accrue from the rapid handling of work. Where it is not necessary to train men to handle machinery and tools, it is well known that men will do more work per day where the job is comparatively short than where it drags along for some time. Men "wear out" a job. The new broom principle is a characteristic of human nature that can be put to good advantage by rushing work to completion. Then, too, the contractor who has a reputation for quick work finds it easier to please his employers and the engineers in charge. Quick work cuts down the interest charges, the engineering and other overhead expenses incurred by the corporation or person who employs the contractor. Finally, the banks always favor the business man who turns over his money rapidly. Hence a contractor who has a reputation of finishing a big job quickly finds it easier to secure financial help than a contractor who is known to be slow.

While all that we have said is elementary when reduced to words, it is noteworthy that many an elementary principle finds few followers until the principle is formulated and illustrated by specific example. The time element in its relation to profit is one that has often escaped the attention that it deserves.

Responsibility for Calculations of Subordinates

FEW problems of the engineering executive are more serious than the securing of accurate calculations from subordinates charged with the detailed technical computations which are fundamental in the analysis of operating conditions in field and plant. There is, of course, a legal side to the question, but that is not its broadest aspect. Of far greater importance in the success of an organization and to the reputation of its officers is the extent to which calculations are scrutinized prior to embodying their results in a definite policy or program of action.

In very large concerns it is obviously out of the question for the general executives to give much time to passing upon the accuracy of their subordinates' figures, but some degree of mental checking is a pretty valuable process. From first to last a keen sense of proportions is one of the most important qualifications of a successful executive in any branch of the engineering industry, and with constant practice able men accustomed to think in large figures and to check by rough unit methods often acquire an analytical skill in "sizing up" problems and situations that is almost uncanny. All down the line, from the president of the company to the head of the most humble department, one finds the best work done when, at least, approximate mental checking is regularly practised. The farther one gets from the drafting board and designing pad the briefer must be the analysis accorded each successive set of figures; but what such scrutiny lacks in minuteness it must make up in ripeness of judgment. Fortunately means are at hand through modern methods of statistical and graphical analysis, the study of unit costs and the extension of construction accounting to place in the hands of the executive reliable data upon which to base his judgments. More than this, the increasing use of the staff conference and the larger measure of co-operation required in deciding upon broad engineering plans and policies are aiding executives to preserve their judicial acumen and to acquire new and helpful points of view in dealing with matters involving vast sums of money and important interests.

In theory it sounds very well to advocate the selection of reliable men by executives and then holding the former strictly to account for all work performed; but in practical affairs the best results are not always insured in this way. If an arithmetical error made by a draftsman leads to a loss of $10,000 on a contract through inadequate checking, the situation will not be remedied by discharging the man making the initial mistake. The time to forestall such mischief is before incorrect figures get into the bid. A wide latitude is desirable for every executive and sub-ordinate, but this does not mean that accomplished work shall be exempt from the most acute criticism which the wise seeker after industrial truth can apply. There is a great deal said in these days about outlining to those lower down in the ranks the problem to be solved and then letting them get the results in their own way—a program welcomed by every employee with a spark of initiative in his composition, but none the less to be followed by an executive appraisal competent to detect serious errors or wide departures from the probable truth. A little use of mental arithmetic or the slide rule, coupled with the cool and experienced judgment of superiors sitting upon the calculations and data singly or in conclave, as their importance dictates, and many a concern will go forward with new confidence to a larger and sounder business success than it has been able to command in the past. All the resources of modern business tend to facilitate this weighing of work coming up from lower desks; the comparative ease with which diverse mental equipments and personalities may be massed upon single problems takes the place of the individual's limited judgment and provides multiple checks upon the work of departments and employees which are valuable safeguards against radical mistakes in administration.—Engineering Record.

False Economy in Engineering Construction

ENGINEERS as a class owe it to their profession to diffuse among laymen whenever possible ideas as to higher standards in professional work. In the abstract this will readily be admitted, but unless instances are cited now and then to show that there is great need for a better understanding of the character and requirements of high grade engineering work ardor is likely to diminish and opportunities for service to the profession neglected. For this reason the Engineering Record brings up the much-worn theme of the false economy in neglecting to employ competent engineers.

False economy of this sort is not confined to any one class of engineering work. A good statement of the case, so far as water supply and sewerage systems are concerned, is to be found in the last report of the bureau of sanitary engineering of the Maryland State Department of Health. The report says:

"The search of this office for maps, plans and records of and information concerning the various water supply and sewerage systems of Maryland has shown that many such systems have been built without the engagement of proper engineering services; that in many cases both design and construction are defective; that a large proportion of systems have been built with very meager and utterly insufficient plans; that some have been constructed without any plans, this particularly being the case where the systems have been built in small sections; that in very few cases are plans changed or added to so as to become proper and complete records of the actual work built; and that in a number of places such plans and records as were made have been carelessly kept and have become lost or burned. In a number of places about the only information that can be obtained is by word of mouth, from the superintendent or some other town officer."

Commenting on this state of affairs the report enlarges on the false economy of the procedure, expressing in excellent manner the ideas so often reiterated in these columns. "The effort of many municipalities," it continues, "to keep down expenses on public works by getting along without the services of an engineer, or by engaging an engineer of inferior qualifications, is a short-sighted policy. The usual result of such a practice is the establishment of improperly protected or uneconomically operated water supplies and poorly designed sewerage systems which do not admit of inspection, are uneconomical in construction, unsatisfactory in maintenance and operation, and which create offensive conditions in the bodies of water into which they discharge. An experienced and capable engineer can not only institute sanitary, suitable and satisfactory water supply and sewerage systems, but can usually save a community, by economical designs, much more than the cost of his services. He will leave, also, in the town's possession full plans of the work and complete records for future reference. The value to the community of such information cannot be overestimated, particularly when connections, additions or alterations are to be made, or when street work of another character is to be undertaken."

The conditions described being granted the natural question is as to the remedy. Without a doubt state supervision, which is becoming quite common in water supply and sewerage work, will go far toward lessening repetitions of this false economy. The work of state departments should not be that of design, but merely of checking, criticising and approving or rejecting plans made by engineers and submitted to the department for approval. In some states supervision is being extended also to highway and bridge work.

There will undoubtedly be many cases, however, which cannot be reached by such supervision, and the only remedy in these cases seems to be to raise the appreciation of the work of the engineer in the mind of the layman. In towns and cities of large size this is not very difficult because the magnitude of the work compels the authorities to demand some degree of ability from their engineering advisors, whether on salary or retainer. The small towns, however, are very difficult to reach for they do not, as a rule, number among their inhabitants engineers of competence who will use their influence to direct the town authorities. The correction of the abuse of false economy in these cases will come but slowly, but that should not discourage engineers from exercising what influence they can when brought in touch with the authorities or citizens of small communities.

Ozone Applied to Water Purification[*]

Editor Contract Record:

Mr. Russell Spaulding has given a short history of the discovery and application of ozone and he has also described some of the European installations. There are some points of interest which could be referred to in this connection, but the subject cannot be fully discussed in a short article, and moreover, I hope at some future time to deal with various methods of sterilizing water.

The name ozone signifies a smell. When an electric machine is operated, a peculiar smell is usually noticeable. Scientists have found that a molecule of oxygen has two atoms, whilst ozone has three, but these three atoms occupy the same volume as the two; in other words, when oxygen is electrolysed there is a contraction in the volume. The scientists have also found that ozone is a most powerful oxidiser, which will rapidly destroy organic matter. It will bleach vegetable colors and act upon many metals.

The oxidising power of ozone is due to the instability of the molecule and the readiness with which it loses an atom of oxygen, leaving the relatively inert molecule of oxygen. The atom which is liberated, in its nascent state, is endowed with great chemical activity (Newth).

Ozone is practically insoluble in water, as only about one-half per cent. by volume is dissolved.

As Dr. G. S. Nasmith explains: "The principle underlying any successful sterilization of water by ozone, is getting the ozone after it is produced into intimate contact with every drop of water, because of the fact that ozone is comparatively insoluble.

This is done in various ways, but as an example take the DeFrise system as installed at St. Maur, Paris. The atmospheric air is strained and dried, then ozonised, compressed and well mixed with the water as it passes through a large cylindrical column. The sterilised water is discharged through one outlet and the surplus air by another. The latter is re-dried, re-ozonised and re-used.

It has been found that the cost of electrical energy to give air a high percentage of ozone is out of proportion to that required for a low percentage. For instance, Chasy found that a seven per cent. charge of ozone in air cost about ninety times as much as one-half per cent. So by experience and research it has been found that a low percentage of ozone is both more economical and practical; that is, the ozone should be highly diluted with air.

In 1908 Dr. Samuel Rideal made a series of interesting tests at St. Maur, Paris, and an average of 1.63 grams of ozone per cubic metre of air or about 0.66 grams per cubic metre of water was found satisfactory. He also found that the volume of ozonized air averaged about 40 per cent. of the volume of water treated, and this decreased the carbon dioxide 2.75 grams per cubic metre, the dissolved oxygen content of the water was increased 3.29 grams per metre, and the oxygen consumed reduced by 28 per cent., while "the result of the bacteriological examination proved that the ozone treatment destroyed all but the more resistent spore form of bacteria present in the filtered water, coli and allied intestinal organisms were entirely eliminated."

The water carried away about 7 per cent. of the ozonized air, and the impurities left in the water as it passed out of the steriliser were further reduced within two hours, as the effect of the ozone carried off.

The water must, however, be clear, and if turbid it must be filtered or clarified by some process, otherwise the ozone process will often be useless.

To ozonize the water it required 57 kw. of electrical energy per one million gallons of water to produce the ozone and 76 kw. to compress the ozonized air and force it into the sterilising column. In all, 133 kw. of electric current were needed per million gallons treated.

Dr. Rideal states that the cost of a plant for ozonising 10 million gallons per 24 hours, in Paris, was as follows: Ozone plant with usual standby, $75,000; motive power, $37,500; buildings, $37,500; total, $150,000.

The annual expenses for running the plant night and day would be, in Paris: Coal, 1,200 tons, $4,500; lubricants, $1,000; repairs, $1,000; one manager, $1,000; two first engineers, $1,600; eight assistants and stokers, $4,800; interest and sinking fund, $9,000; insurance, $500; total, $23,400.

$$\frac{23400}{10{,}000{,}000 \times 365} = .64 \text{ cent per } 1{,}000 \text{ gallons.}$$

On the basis of the cost of such plant erected in Central Canada, the annual working expenses and capital would probably amount to 1½, or 2 cents per 1,000 gallons apart from the cost of filtration or clarification.

Ozone plants require the constant inspection and supervision of engineers. The plant must be worked without interruption and frequent bacteriological examinations be made. These conditions also apply to most other systems of sterilisation, as the system which will run by itself has not yet been found. Failures are usually due to the absence of skilled supervisors.

Some engineers look upon ozone as an expensive luxury. Others consider that the cost of construction and operation of filters can be materially reduced by introducing ozone plant to finally sterilize the water. An ozone plant was installed at Lindsay, Ont., about 1909, but according to reports issued by the Provincial Board of Health of Ontario in 1910, this installation was a failure, the impurities contained in the water were not reduced and the color was not bleached; and as in the course of experiments and tests Dr. Nasmith's assistant "was nearly ozonized into another sphere" further tests were not made.

In conclusion I may quote two reasons given by Dr. Rideal in favor of ozone.

1. It is only a more active form of ordinary oxygen, already existing normally in small quantities in the atmosphere, and continually assisting in natural oxidations.

2. It adds no residue of any chemical to the water and in doing its work of purification it is simply re-

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[*] The contribution under this heading is submitted at our request by Mr. R. O. Wynne-Roberts, consulting engineer, of Regina, in criticism of an article by Mr. Russell Spaulding, of the State Department of Health, New York City, published in our issue of August 13th. In view of Mr. Wynne-Roberts' wide experience in many parts of the world and of his international reputation as an expert in municipal problems, his views cannot fail to be received with much interest.—Editor.

solved into ordinary oxygen, which dissolves in the water and adds slightly to its aeration.

Yours truly,
R. O. Wynne-Roberts.

Proposed Test of Sand for Concrete

THE testing of tension briquettes or compression blocks of concrete made from wet mortars having the same consistency as used in the work was advocated by Mr. W. B. Reinke, of Philadelphia, in a paper read before the last annual meeting of the American Society for Testing Materials.

The procedure suggested by Mr. Reinke is as follows: The sand to be tested and Ottawa sand are first made into mortars of normal consistency, using preferably cement from the work. These mortars are then made into briquettes, the whole operation being in accordance with the standard methods for the making of sand briquettes when testing cement. The amount of water necessary to make a mortar of normal consistency having been found, a new batch of sand and cement in the desired proportions is thoroughly mixed dry and placed in a cylinder that can be revolved, together with a number of flint pebbles, so that the proportion of cement, sand and stone will approximate that desired in the actual work. To this mix is added enough water (generally about 50 per cent. more than needed for normal consistency) to make a mortar having work consistency. The cylinder is then closed and revolved for five minutes. The flint pebbles are picked out by hand and the mortar is made into briquettes. This test, Mr. Reinke pointed out, more closely approximates the condition found in actual work, and the strengths obtained from briquettes made from such a mortar, though, as a rule, far below those obtained from a mortar of normal consistency, correspond to those that may be reasonably expected from the mortar if the same sand and cement are used in construction.

In most cases, using the same cement, more water will be needed to bring a natural sand to normal consistency than is necessary with Ottawa sand. This difference in the amount of water required is accounted for by the difference in granulometric grading, the work sand, as a rule, having the greater amount of fine material, and hence more surface to be covered and a larger percentage of voids. The more water used, the greater will be the loss in strength at early periods. The nearer a natural sand approaches the ideal in physical and chemical composition, the less will be the loss in strength for each additional per cent of water added.

The amount of water, therefore, required to bring a given sand to work consistency forms one of the best measures of the quality of sand.

In mixtures using 50 per cent. more water than required to produce normal consistency, Ottawa sand and good natural sands, Mr. Reinke finds, lose from 25 to 35 per cent. of their strength up to the 28-day period, while a poor sand may lose as much as 70 or 80 per cent. of the strength developed when made into mortars of normal consistency.

Reinforced concrete trusses are used instead of plain beams to support the longitudinal girders of a concrete bridge of the girder type across the river Lagan at Belfast, Ireland. The design is described in a recent number of the "Engineer." The bridge is 30 ft. wide and 195 ft. between abutments and is divided by three pairs of piers into two end spans of about 40 ft. each and two center spans of 50 ft. horizontal clearance. There is a clear transverse span of about 16 ft. between each pair of piers. The piers are of 1:6 concrete, without reinforcement, each pair being connected above high-water level by a reinforced concrete truss, the horizontal members of which are 12 x 12 in. in cross-section. The center vertical and two web members are of the same widths, while two other diagonal members are 12 x 16 in. in area. In the lower chord six ⅞-in. rib bars were used; in the compression members four ½-in. bare were sufficient. The bridge is said to have cost about $12,000.

A full-size cornice model for the Kensico dam of the Catskill aqueduct has been made of galvanized iron and erected at a sufficient height to give the observer an idea of the relative foreshortening of its members. Drawings also have been prepared for a full-size granite model of a portion of the top of the Kensico dam. This is about 30 ft. high by 35 ft. long, and according to the annual report of the Board of Water Supply for 1911 it is to be erected near the site of the dam as a standard for dimensions, etc.

The last few years have seen an extensive development in the methods of handling concrete by gravity in chutes. With this development, however, there seems to be more or less of a tendency to use mixtures which are "drowned." This practice is due to a large extent to ignorance of the laws governing the flow of concrete in chutes, and the ordinary contractor assumes that the wetter the mixture the better the flow, which is in reality not the case.

As a matter of fact, the flow of concrete in chutes is half way between a slide and a roll. That is, the material slides in mass or the component parts of the material roll over one another as the material flows. Many factors determine the best consistency of the concrete, but a too wet concrete is a very hard material to handle, and the results in the finished concrete are hard to determine.

Reinforced Concrete in the Construction of Reservoirs

Engineer Luiggi in a recent number of the Annales de la Societe des Architectes at Ingenieurs Italiens, writes very interestingly on dams for artificial reservoirs. After describing the disadvantages of earthen and masonry dams he advocates most strongly reinforced concrete for the purpose of reservoir construction. Beginning with the Assouan dam on the Nile, the writer describes many of the more recent constructions in this country where impermeable diaphragms have been used, such as the works on the Cold Spring and recently on the Rio Grande River in Colorado, and comments especially upon the ideal type which has been used at Morena, near San Diego in California, and also at Relief in the Sierra Nevadas, "These dams," he says, "destroy all the fear of a destruction by earthquake, because the large body of dry masonry can separate and become displaced, but not disappear. The diaphragm can be torn and let the water of the reservoir through, the water going through the cracks slowly, and not in one great body, as is the case in masonry dams. No great destruction would be produced by such inundations as was in the case of the Johnstown and other similar disasters."

Notes on Highway Bridge Construction

Lack of Uniformity in Specifications—Standardization of Design—Outline of Truss—Panel Lengths—Flooring—Reference Tables for Designers

Specially Contributed by F. Tissington[*]

OWING to the present rapid development of the resources, and to the increase in population in Canada and to the comparative lack of roads as a means of communication, there is a great demand from all parts of the Dominion for the construction of new roads and for the improvement of the existing highways. This incidentally calls for a large output of structural steel for bridges.

So far as can be seen this demand is not spasmodic, in fact there is every indication that it will prove an increasing one and therefore this appears to be an opportune moment to discuss some of the phases of bridge construction as well as that of road surfaces in general, on which so much has been written lately.

In the issue of the "Contract Record" for July 23rd, appeared an editorial under the heading "Economical Engineering," the latter part of which deals with the subject of highway bridges. There is no doubt that if some of the ideas embodied in this comment were adopted a very considerable economy would be effected in a short interval. Innovations are generally regarded at first with some suspicion as we are all more or less conservative. We generally prefer to do something similar to what we have done before, because we are surer of the result.

Uniform Specifications

The first point raised is the lack of uniformity in specifications. Now with one specification only in view, any manufacturer would be able to enlarge his sphere of operations quite easily, as the interpretation of a specification running to perhaps a dozen or more pages is a matter of careful thought and study. Generally there is little likelihood of any organization being able to obtain an exact rendering of all the clauses contained therein, until they have actually manufactured a few bridges and faced the difficulties incident to the circumstances and cope with the ideas of the Provincial Engineer concerned. This feature, unconsciously perhaps in most cases, induces the firm tendering to allow for contingencies in their price, probably causing a larger sum of money to be expended than is actually warranted.

The writer has knowledge of engineers who issue specifications that they themselves do not really understand, as they are copied from specifications drawn up by other engineers. Again, specifications are used which are far beyond the needs of the district for which they are intended, even after allowing for all reasonable increases in traffic for the future.

The writer has had experience with the specifications issued by the Department of Railways & Canals, 1908, and by the Ontario, Saskatchewan, Manitoba, New Brunswick, Nova Scotia and Prince Edward Island governments. The first of these is by far the most logical and concise and appears to cover all the points necessary. This specification is used also by the Quebec provincial government.

Most of the others give results varying slightly from this, so that from a common-sense point of view, there hardly appears to be the necessity for a departure from this standard.

The standardization of design is worthy of a good deal of consideration, particularly in view of the fact that it is proposed to eliminate all odd size bridges, and the independent designing by each bridge works.

The writer suggests that a good service would be obtained sufficient to meet every case, if increments of five feet in the lengths of the spans were adopted.

Most bridge yards no doubt keep records of various types of what they have done and naturally, after a time these become of great use to the estimating department to form the basis of price for new work.

It is only by comparison with what you have done before, that any near approximation can be obtained to the probable cost, and further, the effect that change of design or details has on the weight and price can be more readily traced, if some system of tabulation is used.

Now, if this is true for a single yard turning out only a small percentage of the total number of bridges manufactured in the country, it is evident that by the judicious use of the same principles on a larger scale, that the effect on the cost would be more apparent, and further the necessary staff to obtain that result would be correspondingly smaller in proportion.

No doubt the argument will be raised that better results, so far as price is concerned, will be obtained by competitive design, as each organization could thereby suit its particular style of manufacture, but the writer is of the opinion that if this were the case it would be only temporary, providing an adequate and fully experienced practical staff handled the government designing proposition.

The actual amount of work entailed would in any case be less, as the details of the structure, material lists, weights, etc., would all be carefully worked out once only, and this information guaranteed to be correct, so that it would not be necessary for each manufacturer in tendering to make up an estimate of the weight or in the case of an order, to prepare shop drawings, bills of material, etc.

Distribution of Material

Another important point is the economical distribution of material as it is quite easy to design a bridge or for that matter any structure in a number of different ways, but only one of which can be the cheapest.

It naturally follows from this, that a great deal of research and collection of records is necessary before it is possible to say of any design that the particular one under notice represents the final paring down that is possible for a given specification.

These remarks are not intended to indicate that the danger point is reached so far as stability is concerned, but simply, that you have an exact rendering of every detail within the limits of the specification used and that every pound of material is doing its full share of the work in the most economical way.

Outline of Truss

In starting the design of a bridge, one of the first questions to be settled is that of the general outline of the truss.

The larger proportion of bridges built or building at the present time call for roadways sixteen feet clear between wheel guards, and, adopting the specification of the Department of Railways and Canals as a basis, the arrangement of truss outlines as given below have proved the most economical.

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[*] Chief Engineer, MacKinnon Holmes & Co., Sherbrooke, Que.

Up to 35 ft. span, I-beam bridges.

From 40 ft. to 90 ft. span, Warren poney trusses.

From 90 ft. to 180 ft. span, through Pratt trusses with parallel chords.

Over 180 ft. span, the same with inclined top chord (hog back).

Panel Lengths

The following considerations to a large extent determine the selection of panel lengths.

(1) That the panel lengths should be as long as possible without using 24 in. I-beams for the floor beams.

(a) This has the effect of transferring directly to the abutments a larger proportion of the load to be carried. For instance with four panels one-fourth of the load is carried by the abutments, and three-fourths by the truss, whereas with five panels, the amounts are respectively one-fifth and four-fifths.

(b) Further, if the number of panels is reduced, the quantity of diagonals and posts will be correspondingly less.

As these members are costly to manufacture, owing to the details and the connections to be rivetted in the field, and the further loss of material entailed each time a rivet section is taken out of a tie, it naturally follows, that in most cases a saving in weight can be accomplished.

Even supposing this is not so and that the weight taken out of the truss is put into the floor system the price would still be smaller owing to the relative cost of the truss members and the floor girders, which will be in the neighborhood of five and three cents per pound, respectively, for the two classes of work erected on the site.

(c) Still another reason for keeping the number of panels down to a minimum is the fact, that in small trusses it is often times impossible to use a section small enough, as the specification referred to calls for a minimum sized angle section of 2½ in. x 2½ in. x 5-16 in., and this must be adhered to if only half the sectional area is required.

(d) Except in special cases it is not advisable to design to use a 24 in. I-beam for the floor beams owing to the extra price required by the rolling mills, over and above the figure asked for the other sizes, and also the greater difficulties in obtaining deliveries.

(2) Where possible the use of a forty-five degrees inclination in the bracing members of the truss will simplify calculations, and in a general way this will settle the number of panels to use for a given span, taking into account the foregoing stipulations in table I., the proportions given for length of span, depth of truss and panel length will be found economical, but it should be understood that the writer does not claim that this is the last word on these features.

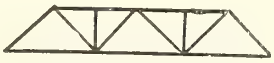
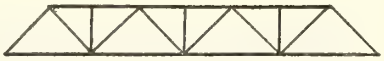
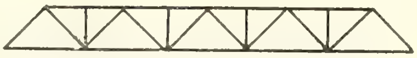
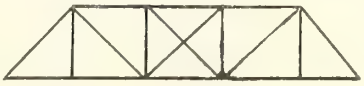
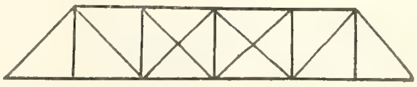
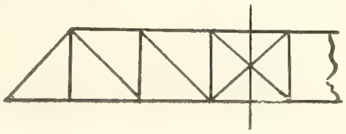
Flooring

Two classes of floor are in general use, viz., timber and concrete.

Whether it is advisable at the present time to lay down so many timber floors, the writer is hardly in a position to state definitely. Owing to financial arrangements this may be unavoidable, but in general, I think the concrete floor to be far more economical in the long run, although in first cost it will exceed the price of a timber floor.

Timber floors as usually laid consist of four-inch planks laid on steel stringers. Occasionally a top

TABLE I

Span Centres	No. of Panels	Depth of Truss	Ratio Span Depth	Panel Length	Type	Diagram
40′	3	6′ 8″	6	13′ 4″	Warren (Poney)	
45′	3	7′ 6″	6	15′ 0″	,, ,,	
50′	3	8′ 4″	6	16′ 8″	,, ,,	
55′	3	9′ 2″	6	18′ 4″	,, ,,	
60′	4	7′ 6″	8	15′ 0″	,, ,,	
65′	4	8′ 1½″	8	16′ 3″	,, ,,	
70′	4	8′ 9″	8	17′ 6″	,, ,,	
75′	4	9′ 4½″	8	18′ 9″	,, ,,	
80′	4	10′ 0″	8	20′ 0″	,, ,,	
85′	5	10′ 0″	8.5	17′ 0″	,, ,,	
90′	5	10′ 0″	9.	18′ 0″	,, ,,	
100′	5	20′ 0″	5	20′ 0″	Through Pratt Parallel Chords	
110′	5	22′ 0″	5	22′ 0″	,, ,,	
120′	5	24′ 0″	5	24′ 0″	,, ,,	
130′	6	21′ 0″	6	21′ 8″	,, ,,	
140′	6	23′ 4″	6	23′ 4″	,, ,,	
150′	6	25′ 0″	6	25′ 0″	,, ,,	
160′	7	22′ 10¼″	7	22′ 10¼″	,, ,,	
170′	7	24′ 3½″	7	24′ 3½″	,, ,,	
180′	7	25′ 8½″	7	25′ 8½″	,, ,,	

Notes on Highway Bridge Construction

By F. Tissington

TABLE II.—Of Moments, Section Moduli and I Beam Sections for Stringers for Highway Bridges

Span in Feet	Bending moments, inch—lbs., timber floor				Sec. mod. at 20000	I Beam section			Bending moments, inch—lbs., concrete floor				Sec. mod. at 20000	I Beam section		
	Dead	Live	Impact	Total		Standard	Bethlehem	Carnegie Special	Dead	Live	Impact	Total		Standard	Bethlehem	Carnegie Special
						ins. lbs.	ins. lbs.	ins. lbs.						ins. lbs.	ins. lbs.	ins. lbs.
10	10,700	90,000	75,300	176,000	8.80	7-15 10.4	8-17.5 14.3	8-17.5 14.6	46,800	90,000	59,000	195,800	9.8	7-15 10.4	8-17.5 14.3	8-17.5 14.6
11	13,600	99,000	86,400	199,000	9.95	do	do	do	56,630	99,000	63,000	218,630	10.9	8-18 14.2	do	do
12	16,200	108,000	93,500	217,700	10.89	8-18 14.2	do	do	67,400	108,000	66,500	241,900	12.1	do	do	do
13	20,240	112,100	94,500	226,840	11.34	do	do	do	79,100	112,100	75,000	266,200	12.8	do	do	do
14	22,930	138,500	118,000	279,430	13.97	do	do	do	91,730	138,500	84,000	314,230	15.7	9-21 18.9	9-20 18.9	10-22 22.8
15	26,460	145,200	123,000	294,660	14.73	9-21 18.9	9-20 18.9	10-22 22.8	108,000	145,200	83,000	336,200	16.8	do	do	do
16	31,200	162,000	136,000	329,200	16.46	do	do	do	122,900	162,000	91,000	375,900	18.8	do	do	do
17	35,220	180,000	150,000	365,220	18.26	do	do	do	138,720	180,000	102,000	420,720	21.1	10-25 24.1	10-23.5 24.6	do
18	39,470	195,720	163,000	398,190	19.91	10-25 24.4	10-23.5 24.6	do	155,520	195,720	110,000	461,240	23.1	do	do	12-27½ 33.3
19	44,480	213,000	177,000	434,480	21.72	do	do	do	173,280	213,000	118,000	504,280	25.2	12-31.5 36.0	12-28½ 36.0	do
20	50,700	230,400	189,000	470,100	23.5	do	do	12-27.5 33.3	196,800	240,000	134,000	570,800	28.5	do	do	do
21	55,910	248,000	203,000	506,910	25.35	12-31.5 36.0	12-28.5 36.0	do	216,970	264,600	146,000	627,570	31.4	do	do	do
22	61,700	265,000	216,000	542,770	27.14	do	do	do	238,130	290,400	160,000	688,530	34.4	do	do	15-36 54
23	72,450	282,500	230,000	584,950	29.25	do	do	do	260,270	317,400	174,000	751,670	37.6	15-42 58.9	15-38 59.0	do
24	78,620	300,000	238,000	616,620	30.83	do	do	do	290,300	345,600	187,000	822,900	41.1	do	do	do
25	85,310	317,500	250,000	652,830	32.64	do	do	do	315,000	375,000	204,000	894,000	44.7	do	do	do
26	91,730	335,100	263,000	689,830	34.5	do	do	15-36 54	340,700	405,600	220,000	966,300	48.3	do	do	do
27	102,220	356,400	270,000	728,630	36.43	15-42 58.9	15-38 59	do	367,420	437,400	238,000	1,042,820	52.1	do	do	do
28	107,000	382,000	296,000	785,000	39.25	do	do	do	395,140	470,400	258,000	1,123,540	56.2	do	do	do

Notes on Highway Bridge Construction

By F. Tissington

TABLE III.—Of Moments, Section Moduli and I Beam Sections for Floor Beams for Highway Bridges

Span in Feet	Bending moments, inch—lbs., timber floor				Sec. mod. at 20000	I Beam section			Bending moments, inch—lbs., concrete floor				Sec. mod. at 20000	I Beam section		
	Dead	Live	Impact	Total		Standard	Bethlehem	Carnegie Special	Dead	Live	Impact	Total		Standard	Bethlehem	Carnegie Special
						ins. lbs.	ins. lbs.	ins. lbs.						ins. lbs.	ins. lbs.	ins. lbs.
10	105,200	420,000	335,000	860,200	43.0	12–40 44.8	15–38 59	15–36 54	337,000	420,000	235,000	992,000	49.6	15–42 58.9	15–38 59	15–36 54
11	115,720	462,880	385,000	963,600	48.2	15–42 58.9	do	do	370,304	462,880	265,000	1,098,180	54.9	do	do	18–46 81.5
12	126,240	504,960	410,000	1,041,200	52.1	do	do	do	403,968	504,960	283,000	1,191,930	59.6	18–55 88.4	18–48½ 88.7	do
13	136,760	547,040	432,000	1,115,800	55.8	do	do	18–46 81.5	437,632	547,040	300,000	1,284,670	64.2	do	do	do
14	176,736	589,120	455,000	1,220,856	61.1	18–55 88.4	18–48½ 88.7	do	471,296	589,120	325,000	1,385,420	69.3	do	do	do
15	189,360	631,200	485,040	1,305,600	65.3	do	do	do	504,960	631,200	352,000	1,488,200	74.4	do	do	do
16	201,980	673,280	515,000	1,390,260	69.5	do	do	do	538,624	673,280	375,000	1,586,900	79.4	do	do	do
17	214,600	715,360	550,000	1,479,960	74.0	do	do	do	572,288	715,360	400,000	1,687,650	84.4	do	do	21–57.5 116.9
18	227,230	757,440	585,000	1,569,670	78.5	do	do	do	605,952	757,440	420,000	1,783,390	89.2	20–65 117.0	20–59 117.2	do
19	239,850	799,520	620,000	1,659,370	85.0	do	do	21–57.5 116.9	639,620	799,520	445,000	1,884,140	94.2	do	do	do
20	252,480	841,600	650,000	1,744,080	87.2	do	do	do	673,280	841,600	470,000	1,984,880	99.3	do	do	do
21	265,100	883,680	685,000	1,833,780	91.7	20–65 117.0	20–59 117.2	do	706,944	883,680	490,000	2,080,620	104.	do	do	do
22	277,730	925,760	715,000	1,918,490	96.0	do	do	do	740,600	925,760	515,000	2,181,370	109.	do	do	d0
23	290,350	967,840	742,000	2,000,190	100.0	do	do	do	774,272	967,840	540,000	2,282,110	114.	do	do	do
24	302,970	1,009,920	770,000	2,082,890	104.1	do	do	do	807,940	1,009,920	555,000	2,372,860	119.	20–80 146.7	20–72 146.7	24–69.5 160.7
25	315,600	1,052,000	765,000	2,132,600	106.6	do	do	do	841,600	1,052,000	555,400	2,449,000	123.	do	do	do
26	328,200	1,094,000	840,000	2,262,200	113.1	do	do	do	875,300	1,094,000	610,000	2,579,300	129.0	do	do	do
27	340,000	1,130,000	850,000	2,320,000	116.0	do	do	do	910,000	1,130,000	620,000	2,660,000	133.0	do	do	do
28	356,000	1,180,000	920,000	2,456,000	122.8	20–80 146.7	20–72 146.7	24–69.5 160.7	950,000	1,180,000	665,000	2,795,000	139.8	do	do	do

wearing surface of two inch planks is placed upon the four-inch timbers.

The permissible pitch of the steel stringers is three feet six inches, and the average weight of the timber flooring will be about eighteen pounds per square foot.

The concrete floors are generally about five or six inches thick, with steel reinforcement to carry the concentrated loads safely. The stringers can be placed further apart say four to four feet six inches, so long as sufficient reinforcement is used. This type of flooring weighs from sixty to seventy-five pounds per square foot.

Loads on Floor System

These consist of the dead weight of floor, and the specification calls for a distributed load of 100 pounds per square foot of floor surface, i.e., between wheel guards, for the live load, or a concentrated rolling load of 24,000 pounds on four wheels, equally distributed, the axles being 8 ft. centres and centres of wheels 6 ft.

Whichever loading produces the greatest bending moment is to be used.

The impact clause in this specification reads:—

$$\text{Impact} = \frac{\text{Live Load}^2}{\text{Dead Load} + \text{Live Load}}$$

If this is investigated it will be seen that an increase in the dead load will reduce the impact, whereas if the dead load is reduced, the value of the impact is thereupon increased.

So that within a comparatively wide range it does not make any appreciable difference to the result if the dead load is not taken very accurately.

A study of Tables II. and III. will make this clear particularly when it is stated, that in this particular instance the dead loads for timber and concrete flooring were taken at about the ratio of one to four respectively.

Stringers

Table II. will be found useful in determining the size of I-beam section to use for a given case.

The first column gives the length of a panel, and lengths varying from ten to twenty-eight feet have been calculated. The next three columns give the bending moments in inch-pounds for dead and live loads, and the increment to be added for impact, the flooring being of timber.

These figures are produced from the data given previously, and it should be noted that in most cases the concentrated live load will determine the amount of the bending moment, and not the distributed live load. With timber floors and panel lengths of 27 ft. and 28 ft. however the distributed live load produces the greater value, whilst for concrete floors figures given in the live load column are determined by the distributed load, and only those referred to as being the same as for the timber floor covering are obtained from the concentrated loading.

The three columns headed, "I-beam sections" for both timber and concrete floor coverings quote the size of section permissible to use so far as Standard, Bethlehem and Special Carnegie sections are concerned, and the figures immediately below the size represent the corresponding section modulus.

This table should prove of value in selecting the most economical section of I-beam to use taking into account the current market price of the three types of beams.

Floor Beams

Table III. is a similar one to that described above for stringers.

Unlike Table II. however, the live load bending moment is in all cases determined from the distributed live load instead of from the concentrated.

The Treatment of Sewage Discharged into Tidal Waters[*]

By H. C. H. Shenton

In a paper read before the Engineering Club of Philadelphia, Mr. George C. Whipple gave the results of a series of experiments made in order to ascertain the effect of sewage pollution upon the water supplies drawn from the Great Lakes in America. These experiments have no reference to tidal waters, but they show very clearly that owing to the currents induced by winds, sewage may be carried for miles out in a great lake and cause serious pollution at the drinking water intakes situated 4, or even 6, miles from the shore.

Mr. Whipple gave the clearest evidence that the currents induced by winds may, and do under certain conditions, pollute the water miles from the shore. He shows that "the sewage is projected through the lake water for several miles with relatively little dilution." Experiments made with floats showed that the angle of dispersion of the sewage varies according to the velocity of the wind in the Great Lakes. Undertow currents induced by the wind were found to have an important bearing upon the dispersion of the sewage. During the summer season the temperature of the sewage is ordinarily about the same as that of the surface water of the lakes. Where the sewage was discharged at the bottom of a lake at a considerable distance from the shore it was found that the surrounding water was much colder, owing to currents induced by the winds, and the warm sewage, being lighter than the cold water into which it was discharged, tended to rise into the upper strata and to be carried away from the shore by the outward surface current. On the other hand, when the warm shore water was flowing outward along the bottom, owing to a different wind, the sewage had less tendency to rise, but was carried away from the shore by the outward bottom current. Thus, during the summer the movements of the wind, whether towards or away from the shore, tended at most times to carry the sewage away from the shore rather than towards it. Though in general it was found that the dilution of the sewage discharged into the lakes was ordinarily very great, it was found to be very variable, and under certain conditions, which occur several times a year, the sewage was projected for several miles with relatively little dilution in the direction of the water intakes. Observations of the number of bacteria in Lake Michigan water, taken at different distances from the shore opposite a sewer outfall, showed that there were 1,268,000 bacteria per cubic centimetre at the mouth of the Milwaukee River, 207,000 per c.c. 1 mile east of the river, 2,000 per c.c. 2 miles east, 970 per c.c. 3 miles east, 225 per c.c. 4 miles east, and 45 per c.c. 5 miles east. The water supply intake is situated 3.5 miles in a straight line northeast of the river, and here the average number of bacteria was 1,182 per c.c. at the surface and 694 per c.c. at the bottom, the largest number being 3,720 at the surface and 1,600 at the bottom, and the smallest number being 20 at the surface and 50 at the bottom. Also, taking all the samples collected at points more than 1 mile away from the shore, it was found that when the wind was blowing towards the shore, and thereby inducing an outward undertow current, the bottom water contained four times as many B. coli, as the surface water, but that when the wind was blowing off-shore the surface water contained eight times as many B. coli as the bottom water.

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[*] Extract from paper read before the Association of Managers of Sewage Disposal Works.

Daily analyses of the water at the North Point pumping station, Milwaukee, showed variations of from 5,900 bacteria per c.c. to 330 per c.c. within a few hours, while coli are often present in 1 c.c., and are occasionally absent from 1 c.c. on the following day. It is therefore sufficiently evident that the dilution afforded by the passage of sewage through 3½ miles of lake water is not sufficient at all times to produce satisfactory purification, and the fact that this occurs in a lake where a distinct current of sewage through the water would hardly be expected shows that there are, no doubt, similar possibilities in the case of tidal waters. It is evidently not sufficient to discharge sewage into deep water of limitless extent, seeing that the sewage may remain undiluted and flow in a distinct current in any given direction, and cause trouble at a point at a considerable distance. The dispersion of the sewage and its thorough mixing with the diluting water must be accomplished before proper purification can take place.

The report of the Metropolitan Sewage Commission of New York, in considering the discharge of the sewage of that city into tidal waters shows that the experts have come to the same conclusion as our own Royal Commission with regard to the importance of dilution. In both cases the degree of dilution afforded by the stream of waterway is taken as the factor to be considered in fixing any definite standard. The New York Commission are of opinion that an immediate test of the present state of the water should show that the dissolved oxygen does not fall below a certain figure.

Standards of Purity

Enough has been said to demonstrate the impossibility of stating that sewage discharged into tidal waters should be of any particular standard of purity. In the most recent works carried out, or in contemplation, near home we see that a very high degree of purity is considered necessary. One may instance Southend, Faversham and Whitstable, where the works are, or will be, of a most elaborate character.

In America, where a great deal of attention has been given to the matter lately, the principles that are being adopted may be gathered from a consideration of the recommendations of the New York Commission, which are as follows:—

(1) Garbage, offal, or solid matter recognisable as of sewage origin shall not be visible in any of the harbour waters.

(2) Marked discoloration or turbidity due to sewage or trade wastes, effervescence, oily sleek, odour or deposits shall not occur except perhaps in the immediate vicinity of sewer outfalls, and then only to such an extent and in such places as may be permitted by the authority having jurisdiction over the sanitary condition of the habour.

(3) The discharge of sewage shall not materially contribute to the formation of deposits injurious to navigation.

(4) Except in the immediate vicinity of docks and piers and sewer outfalls, the dissolved oxygen in the water shall not fall below 3 c.c. per litre of water. Near docks and piers there should always be sufficient oxygen in the water to prevent nuisance from odours.

(5) The quality of the water at points suitable for bathing and oyster culture should conform substantially as to bacterial purity to a drinking water standard.

The meaning of which is that there will probably be several outfalls, some of which will discharge crude sewage, some partially purified sewage, and some sewage purified to a very high degree, as the special conditions may demand.

Following this policy as outlined, it is clear that the treatment of sewage discharged into tidal waters must vary from the discharge of crude sewage or tank effluent at places where it can do no possible harm to the most complete system of tanks and filters, sterilization being generally held in the background as a final possibility. These facts show each case where sewage has to be discharged into tidal waters. The chemist, bacteriologist, pathologist and engineer must each have a great deal of work to do in order to ascertain the exact degree to which it is necessary to purify the sewage at any given place, and such scientific attention will often result in the saving of a very large sum of money on constructional works and maintenance, but where this skilled attention is not given in the first place it will generally be necessary for the authority to put in works of an elaborate nature which may sometimes be altogether in excess of the requirements.

It is not to be imagined that sewage can often be discharged into tidal waters without any purification, but the degree of purification required before the effluent is discharged must vary considerably, and its attainment will depend not only upon the design of the works, but upon the management which they receive. Further, that the judicious improvement and better working of existing systems may be attained by the efforts of the manager is clear, and of this fact the works at Erith are a striking example.

Types of inflammable buildings with inadequate provisions for the safety of the occupants are to be shown in moving pictures at public meetings throughout the State of Arkansas by the Arkansas Fire Prevention Society.

Rough preliminary handling of rails is not entirely objectionable, in the estimation of Mr. W. C. Cushing, chief engineer maintenance of way of the Southwest system of the Pennsylvania Lines and chairman of the rail committee of the American Railway Engineering Association, as expressed at the recent convention of the association. As Mr. Cushing pointed out, rails must be able to stand hard usage in service, and rough handling before use may reveal inherent defects.

Cutting a concrete sewer with a steam shovel was recently accomplished by the New York, Chicago & St. Louis Railroad in grade-reduction work at Cleveland. Through misinformation the railroad engineers believed the 8-ft. circular concrete sewer to be 6 ft. lower than it was, and when it was encountered in the middle of the night it had to be cut through or the work had to be suspended for the time being. The former course was chosen, and it was carried out successfully with the Bucyrus 70 in use on the work. The sewer was of first-class concrete, reinforced with 1½ x 3/8-in. flat bars transversely and ½-in. rods longitudinally.

Method of Distributing Sewage on Bacteria Beds[*]

THE bacterial system has been adopted at Fenton to treat the flow from 26,000 inhabitants, and has a capacity of 6,300 cubic yards of bacteria beds, together with one fixed spray bed of 520 cubic yards capacity.

The main beds are rectangular provided with two troughs and four arms per acre. The beds are divided into four sections, one complete arm traversing each section of the bed, and distributing on the intermittent principle. Each complete unit is hauled from end to end of the bed by means of an endless rope. The power houses are two in number, oil engines being provided in each house to drive the gear for operating each half of the bed. The gearing in each house is arranged in such manner that upon either engine failing or being temporarily closed down for cleaning one engine has the necessary reserve of power to drive the four complete arms of the beds, and thereby obviate the necessity of closing down and losing half of the available area of bacteria bed.

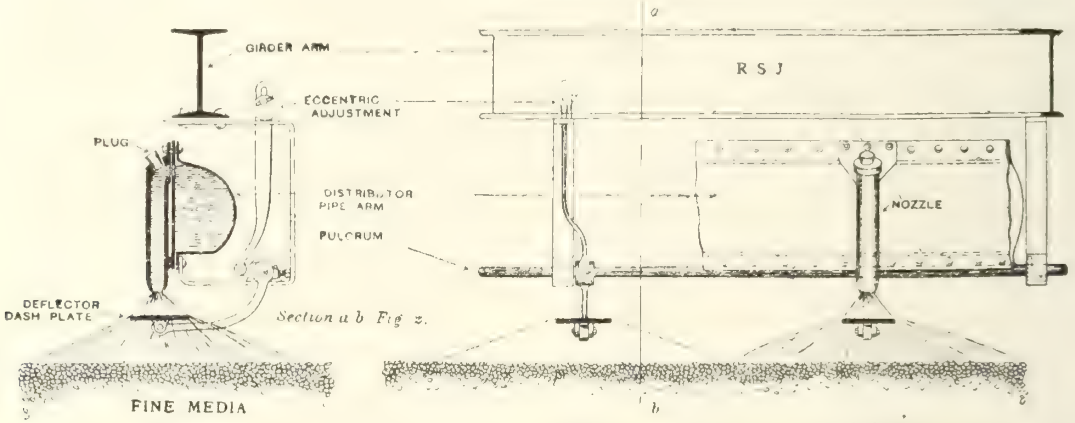

FIG. 1 FIG. 2 FIG. 3

1—Details of jet spray adopted on rectangular beds.

The distributing arms are fed from the trough by means of a syphon, these arms have a gradual taper towards the end farthest from the syphon, and by this construction even pressure is maintained throughout the entire span of the arm, and, naturally, even distribution at each nozzle fixed thereto. Plate No. 1.

The nozzles, it will be seen, are attached to the flat side of the distributing arm, and with the type of deflector plates as shown need be no less than 12 in. to 18 in. apart. An excellent spray is obtained from this type of deflector, and arrangements are made, as shown, for altering the height and angle and obtaining an increase or decrease of spray density. Plugs are provided at the top of the nozzles for cleaning out the pipe when necessary. These nozzles are about ⅝ in. diameter at the point of discharge. The outlet nozzles stand some 3 in. to 4 in. above the bed media and discharge upon either fan or circular deflectors, which throw a fine film which links jet to jet and produces a complete unbroken spray film from end to end of the arms.

These distributors have been running at Fenton over a period of five years, and have given excellent results with practically no wear.

The arrangement of filters in rectangular blocks, taking two troughs and four arms to the acre, reduces waste of space to a minimum, the need of division walls being eliminated, the extra filtration area gained over circular beds erected upon the same site being as 1 is to .7854.

The actual power required to drive these distributors is about 1½ b.h.p. per acre, a small margin over and above this figure being absorbed in the reverse motion which takes place at the end of each journey.

Much experiment and research have been carried out in England and America on the method of distribution known as the fixed spray principle, both continuous and intermittent sprays having been erected and tested. The department has carried on much research in this type of distributor, and with the advice and guidance of the borough sewage engineer admirable ideas and sites have been fixed, and I have no hesitation in saying a fixed spray nozzle of great merit has been evolved, working on the intermittent principle, the mechanical construction having been perfected and patented by Messrs. Hartley, Causton & Richmond, Limited, engineers, of Stoke-on-Trent.

Unlike the whirling or centrifugal spray, or the fine nozzle small cone spray, the nozzle adopted at Fenton has features entirely its own. From a head of 6 ft. the sewage passes from an automatic dosing chamber to the distributor pipes carrying the fixed jet sprays buried beneath the surface of the bed, the curve of discharge and rest controlling equal alternate periods of one cycle. Particulars of this jet are shown in Plate No. 3. The large opening of the jet and also the equally large deflector will be noticed, these being distinct points in the design, the large opening in the nozzle being practically free from the trouble of clogging, and the deflector giving the maximum curve under the discharge force of this nozzle. The nozzles stand 7 in. to 8 in. above the media surface.

It will also be noticed that the deflector may be swung completely over, and should any jet become clogged, which is most unlikely, the time taken during the operation of cleansing it is naturally reduced to a minimum. It must be borne in mind that unless overlapping of the maximum perimeter of jet upon jet takes place all over the bed 22 per cent. of the area is lost in every design of this type of distributor. Experiments must now be made with a spray nozzle having a deflector fitted of such design and construction that the thrown spray shall cover one complete square unit of the bed surface, leaving no margin between nor overlapping the wetted periphery of any jet in the vicinity, and also the same periphery of this spray should be arranged to reduce from maximum to zero, and vice-versa, with mechanical precision during the period of distribution, thereby effecting no undue overdosing of any area between the maximum and zero points.

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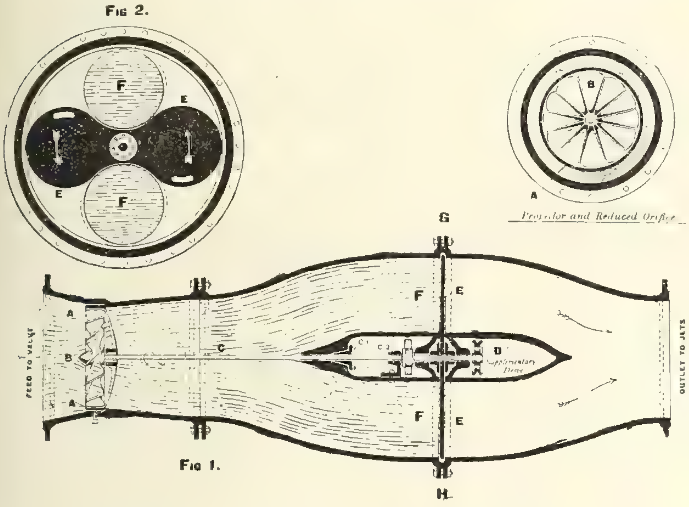
[*] From a paper by U. W. Adams, Chief Assistant Sewage Engineer, Stoke-on-Trent, Eng.



2—Adams' automatic revolving dual disc valve

I have drafted an idea for a self-contained automatic revolving dual disc valve, for causing cyclic variations on continuous flow or intermittent dosing distributors, applicable to this type of jet distributor, as shown on Plate No. 2. The soundness of this idea I have not tested in practice and it is only added to this paper to call forth the opinions that must be held by many engineers present who have had experience with this method of distribution.

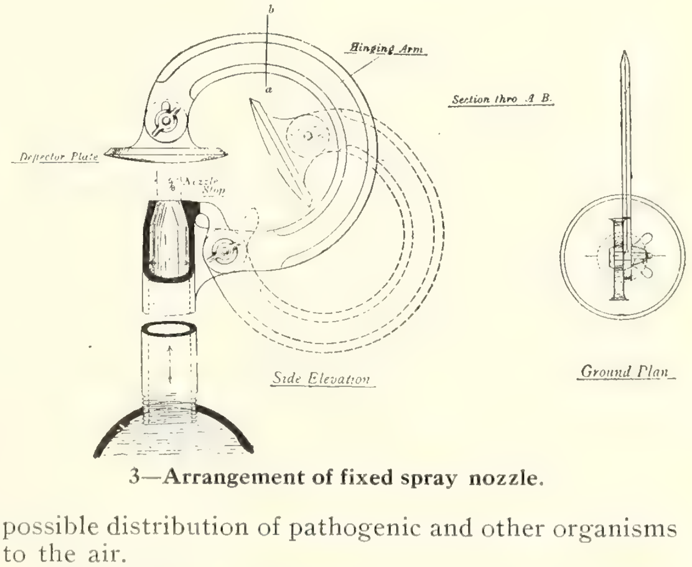
The idea in brief is as follows: from a given head of water maintained the flow is carried by hydraulic main for increase of velocity to a reduced throat or orifice "A" in which is fitted a fan propeller "B" keyed to a shaft "C," which is carried on bearings "C1" and "C2," these being totally enclosed, of the roller or ball type, and fed from the outside with grease through suitable lubricators.

Fitted to the shaft "C" at "C2" is a gear wheel of thirty teeth working in mesh with a wheel of sixty teeth connected to a shaft "D," on which is keyed the dual disc "E," which is arranged to run at half the speed of the propeller "B." The time variation of cyclic discharge could be governed directly by the angle given to the blades of the propeller. In order that the propeller may never come entirely to rest bypass ports of small area are allowed in each disc of valve "E" which do not come into operation until the main orifices "F" are completely covered. The disc valve "E" should by this means therefore never lose entirely its centrifugal force, while acting in the stead of a flywheel to the temporarily retarded propeller.

The orifices "F" are of such area that the unimpeded flow from the main carrier may pass through, thus retaining the maximum wetted periphery of the total jets fed when full open, and reducing in mechanical curves until the discharge has reached zero, which action is carried on in vice-versa variation throughout any fixed period of duration. This arrangement I have called "The Adams Automatic Variation Valve," applicable to fixed jet spray nozzles, and capable of producing cyclic variation of nozzle pressures. In the event of practice proving the inefficiency of the propeller drive arrangement of the valve, the valve could be easily operated by a small geared electric power unit of very small horse power, ¼ h.p. being quite ample to operate the largest valve. The valve barrel and ducts will be self explanatory from the diagram. Fig. 1 shows a side section through the valve, and Fig. 2 a section through G H, showing the ports "F" in open position and the disc valve "E" in its relative position.

Fixed sprays up to the present have played little part in the distribution of the sewage of this department, but from results obtained on the experimental bed at Fenton it appears that this method of distribution, scientifically tackled, holds great possibility of rivalling the more costly methods here employed, where power cost is now at a premium. With the type of variation valve described, perfected, or some similar method adopted whereby each portion of the filter could receive the necessary and even dose, and the same period allowed for very necessary aeration, I see no reason why the very heavy expenditure upon power hauled distributors that is involved from year to year at most works, should not be entirely abolished.

Fixed jet sprays obviously could not be recommended as a means of distribution on works in the close proximity of towns and dwellings, as the fine spray under the influence of prevalent winds could certainly be carried some distance, and should the carried spray contain much hydrogen-sulphide, aerial nuisance would certainly result, to say nothing of the possible distribution of pathogenic and other organisms to the air.



3—Arrangement of fixed spray nozzle.

Many types of distributors in the experimental stage owe part of their subsequent perfection to one or the other of two experimental beds laid down at Hanley, and used for this purpose alone. These experimental beds are rectangular and circular in design. The early type of "Scott-Moncrieff Distributor," with the open drip trough supported by lattice girders of single arm design, driven by an oil engine attached thereto, and running on an outside circuitous mono rail, was first erected on the circular experimental bed, and was subsequently perfected and removed to give place to prototype of the single arm distributors driven by a small motor carriage on the outside rail as adopted at the Burslem works. An automatic fixed jet spray distributor is the latest to be erected on this circular bed.

The first distributor to be fitted on the rectangular experimental bed was known as the "Piggot rectangular experimental distributor," and was fed from a central trough by means of a syphon, the cross arm being fitted with small bent ⅜-in. copper distributing pipes about 6 in. apart without a deflector plate of any description. This distributor was the first model in the experimental stage of the type now so popular, which embody all its principles, only in a more perfected form. This experimental model, which was manufactured by Messrs. Piggots, of Birmingham, was the outcome of ideas and experiments by Mr. Makepeace, to whom, therefore, a great part of the credit is due for the present excellent distributor of to-day.

An automatic distributor of unique design is now being erected, in the experimental stage, on half of the rectangular beds set aside for such tests and experiments, by Messrs. Daniel Adamson & Company, of Dukinfield. This distributor holds great promise when finally perfected. The propulsion is effected by the flow of sewage to rams having a rack attached thereto, which, working in a mesh with a free wheel pinion upon the shaft carrying the traverse rollers, carries the distributor over the surface of the bed, suitable reverse gear turning the water into a duplicate ram for the return journey, and vice-versa. The chief point in this new distributor is that the water used in operating the rams, after propelling the distributing arm and syphon, passes through the spray pipes for distribution on the bed, thereby doing away with the necessity of power haulage.

Foundation Problems and Their Solution

THE foundation of a building is the first part of its construction, and by far the most important to be made exactly right. In the latitude of Chicago there is no such thing as a foundation that is safe from frosts unless it extends, at least, 3 feet 6 inches below the natural grade of the lot on which the building is erected.

Big engineering propositions of foundations for sky-scrapers and extremely large buildings are always taken care of by capable engineering research and application, and have been discussed at length by the technical press from time to time. What we are calling attention to now is the foundation problem of the little cottages, the more pretentious residences, or other smaller buildings, of which there are immense numbers, and which constitute the larger part of all construction as well as the main consumption of all building materials.

Let us look at the foundation problem fairly and squarely. It is customary, when a man intends to build a bungalow, to look for the very cheapest material possible for all that part of the building which is underground, because it does not show. As such foundations have a very insignificant load, almost anything is sufficiently strong to carry it.

Fifteen years ago twenty-four-inch rubble stone walls, laid in lime mortar and having a footing of double-sized rubble stone, was the standard foundation for such buildings. Such basements were invariably damp, and it made very little difference whether the frost got under the footing or not, because there was enough "give and take" in the irregularity of the bearings of the rubble and the soft mortar, to take up any ordinary frost heave, or to conceal the cracks that were the results of minor settlements in the foundation walls, where the footing happened to rest on soft spots of earth or on shifty sand.

At the present time the most popular foundation for such a landing has come to be the 12-inch concrete wall, which, when properly made, is just about as nearly perfect proposition for the purpose as can be devised; but not one out of a thousand is properly made. The contractor who takes the job generally figures from the plans of an architect who has never seen the lot and who assumes that the grade line will represent a level surface of the ground. He shows excavations amounting to a depth of 4 feet, so as to give a 6-inch margin. The ground slopes to one corner of the building in nearly every case, so the excavation on the low side will be no more than 6 inches or 10 inches. In fact, it may not extend through the black loam of the surface, and at that corner the building is entirely unprotected from the attacks of frost.

The contractor cannot afford to furnish any more material than he has figured to use in the foundation, for more than likely he has taken the job so as to simply make his own wages by putting in the foundation. Should he deepen the trench on the low side, and add three additional yards of concrete to his foundation, it would amount to his wiping out all the profit as well as his wages for putting in the foundation. The result is that the foundation as put in may be short of cement, but even when there is plenty of cement put into the concrete, the work is done so cheaply that the contractor cannot afford to mix the concrete properly. It is usually just a case of shoveling in some crushed rock, along with a little sand and a little cement to make a spongy, porous concrete which is not worthy of the name and not fit for any structural use.

Naturally, such a foundation has to be first daubed up with plaster on the outside, then it has to be treated with all manner of waterproofing compounds and devices to keep the soil waters from penetrating the wall and so making a wet basement. In spite of all the precautions of waterproofing, close to one hundred per cent. of all such foundations are damp, are wet, and will always be unsatisfactory.

Notwithstanding all that has been published and said by technical men on the subject of mixing concrete and making it wet enough so as to puddle the moisture to the surface, very little puddling of concrete is ever really done. The main dependence for securing solidity by the usual foundation contractor is the weight of the material when it is shoveled into the forms. True, the workmen may walk backward and forward, stepping on the material, and so tamping it down with their weight, but it is incomplete, insufficient and unsatisfactory. If this is not remedied it is quite certain that there will be a return to the use of rubble stone for foundation purposes, which will keep the concrete man out of a very large portion of the business which he now enjoys.

Let us assume that all the materials to make good concrete are assembled on the job, still it takes some additional assembling to that of the materials. It requires sufficient water, and water is not always the easiest thing to obtain on a little foundation job. When the weather is very hot, and the water has to be hauled in barrels or in a tank wagon, there is a very pronounced tendency to skimp on the water, just as there is to skimp on the cement and in every material that is in the work. There is no substitute for water or for adequate mixing in a concrete job.

Half of the contractors who put in residence foundations proceed by the following method: They will spread out on a mixing board, or on the ground, a yard of crushed rock. On top of this they will spread half a yard of sand; on top of the sand they will spread, fairly evenly, four or five bags of cement. Then they will throw on a few buckets of water and immediately begin to shovel the entire mass into the forms, without any pretense of turning it over or mixing it, claiming that the stuff is all loose and wet and mixes as it goes in. They claim that it is impossible to keep it from mixing, and, consequently, there is no use to go to the expense of paying men to shovel several tons of material two or three times, when it can be done with one shoveling.

Mixing, Tamping and Proportioning

This mixing proposition is very seldom improved upon, even when there is a small hand mixer on the job, because it is somewhat of a back-breaking undertaking to grind the crank of a hand mixer, and the laborer who has this part of the work to do does not care a rap about the quality of the material he is producing, and every turn that he can avoid is carefully avoided.

There is no question whatever but that a good solid foundation made of concrete, well mixed, well tamped and properly proportioned, will be just about as tight as a jug. If it extends down to 3 feet 6 inches below natural grade it will be just about as safe from frost and in every way as nearly perfect a foundation as can be secured.

When the excavation for a foundation extends 3 feet 6 inches, or even 4 feet below natural grade, it will not be impervious from an attack by frost, unless the back-filling of dirt against the foundation, when finished, is well rammed into place and the dirt piled up a little higher immediately at the edge of the foundation, so as to throw the surface water a few inches away from the building.

It would be difficult to estimate the amount of money involved in the damages to buildings where lack of depth of the footing allows the frost to go under the building.

There is an idea prevalent among even experienced contractors that loose dirt from the excavation can be piled up against the foundation of the building and so built up to make the 4-foot depth to their footing. Made ground is not a protection against frost until it has had from thirty to thirty-two winters, even though the footings are placed as deep as sixteen feet in made ground.

Made Ground

The writer recently observed the foundation of a building resting on made ground which extends ten feet below the grade of a modern street. The total filling, however, amounts to about twenty feet. Last winter the frost penetrated into the made ground and got beneath the footings, which were ten feet below the present grade, and raised all four corners of that building so that extensive repairs were necessary during the present summer. In fact, made ground never becomes as solidly stratified for the resistance of moisture as the stratification of the natural surface of the earth, and this is why we always use the expression of "natural grade."

Made ground should never be considered as having any value in the placing of the footing of a building. A 3-foot 6-inch or 4-foot excavation below the surface of the natural grade does not indicate that the penetration of frosts in severe winters is limited to that depth. Penetrations of frost into the ground have been found seven and even eight feet. But it does not mean that in the usual construction of buildings the quantity of moisture that penetrates through the various earthly strata to the depth of three and one-half feet is not sufficient to form a crystalline arch of ice which by contraction and expansion disturbs the footing of the building.

The surface drainage of the building at completion naturally becomes an important matter, for if rain water is kept away from the wall it will not go under the foundation. The owner should always be cautioned with regard to his responsibilty in keeping the walls, especially those of a new building, from standing in water while the fall rains are soaking into the whole surface of the ground, because when the frost period comes this water in the soil will be the vehicle upon which the frost travels to go underneath the footings and destroy the superstructure.

There is no unknown factor to the problem about the construction of a perfect foundation for the buildings of the class mentioned, but there is a very great difficulty in securing the construction of such a foundation which is positively good. The services of a capable architect are very cheap where they result in securing a good foundation. No architect has performed his duty to his client unless he has provided for a foundation which will go down deep enough below natural grade to protect it from the frost danger and dense enough to protect it properly from the seepage of lateral pressures of water.

There is no necessity for a wet or damp foundation, nor is there any occasion for a foundation that heaves with the frost; because it is simple enough to have it extend at least three feet six inches below natural grade, at all parts of the building, and to have the dirt filled in and thoroughly tamped. Then have the outside of the building drained carefully for a year or two, or until the dirt immediately against the foundation has had a chance to assume something very near its former consistency when in its natural state, before the excavation occurred.

The practical foundation men who read these lines will find something which, if applied, is well worth the space devoted to this article.—Rock Products.

Insulating concrete roofs to prevent condensation beneath them is required in certain classes of structures, such as paper mills. According to a United States engineer, a cheap and efficient method of insulating is to use a porous concrete made up of screened cinders and cement. A mixture of this kind that has given satisfactory results consists of one part of Portland cement and ten parts of clean steam boiler cinders. This should be placed as carefully as possible in order to insure its porosity, and after setting should be troweled over with a flat coat of mortar to give a suitable surface for the roofing material.

Coatings for Concrete

By G. D. White.

CONCRETE for building purposes, whether in solid, reinforced, hollow block, tile, brickette, or whatever form, is not consummate. Unless extreme care is exercised in the preparation and workmanship for solid or reinforced work, the resultant concrete is not impermeable, or at least not uniformly impermeable, to water and moisture.

The fact that dry walls are essential to health and comfort is generally known and so well appreciated that the question of dampness has been a restraining agent to a much larger and more extensive use of concrete. The tendency to stain, the frequence of efflorescence, the difference in color due to difference in materials and to intermissions in concrete, are defects of a less serious nature.

If to the strength, cheapness, durability, and fire-resisting properties of concrete can be added impermeability to moisture and decoration, we will have a building material as nearly perfect as the world has ever seen, and this within the means of every builder.

For the sake of convenience, I will divide these into four classes. In my investigation of the various treatments and materials included in these classes, I have endeavored to be unprejudiced and to give to each its true worth and true value.

First—Waterproofing compounds in liquid or powder form, mixed with the concrete in its preparation.

This is a help in that it lessens and retards, in a measure, the moisture-absorption tendency of concrete. It fails in the desired attainment for the following reasons:

Improper distribution, which is difficult of regulation.

When properly distributed, it does not render concrete entirely impervious to moisture.

It has a tendency to weaken the tensile strength of concrete.

It does not decorate. The increase in value is not proportionate with the increase in cost.

It deteriorates with age; that is, a concrete block containing the waterproofing compound on the first application of water will absorb certain varying quantities. On subsequent applications, allowing the block to dry in each instance, large quantities are absorbed.

Second—Treatments preparatory to the use of linseed oil paints.

Naturally, I would be prejudiced in favor of this process if it offered even a partial solution to the problem.

Treatments in various forms have been advanced and recommended by some of our leading master painters and endorsed by most able research chemists.

Three Treatments Recommended

For the sake of brevity I have included in my paper but three of these treatments:

(a) Hydrochloric or muriatic acid wash.

(b) A wash consisting of a solution of zinc sulphate and water.

(c) A wash consisting of ammonium carbonate and water.

From a chemical standpoint, muriatic acid, no matter in what strength, nor what the character of the concrete, is not only less useless as a remedy, but detrimental in its action. Master painters who have endeavored to put it in practice have discovered to their sorrow a confirmation or a demonstration of the chemical theory.

In the manufacture of chemicals and chemical colors, we can standardize our solutions by the use of molecular formulae, and thus produce the product sought without a waste of any single ingredient, except, perhaps, water. Unfortunately, in preparing concrete surfaces to receive paint, we have no way to determine what strength of solution should be employed. Were such a determination possible, we should have to make it for every different piece of concrete, and in case of blocks for every block, because we could not be sure of uniformity.

Even with the required strength of solution, we still lack a method of application that will insure the proper neutralization, and so uniformity of results is uncertain.

Zinc sulphate and ammonia carbonate as applied to concrete, unless fully satisfied by the presence of calcium hydroxide, are still soluble in water, and thus offer difficulties of a serious nature.

The neutralization of calcium hydrate and calcium oxide appearing on the surface of concrete does not always mean that the surface will remain neutral. Moisture finding its way from the inner portions of the block or wall carries with it alkali—the foe to linseed oil paints.

The treatment with zinc sulphate or ammonium carbonate, even though successful, does not offer a solution to the problem, because a linseed oil paint is unsuited for either exterior or interior painting of concrete. The gloss robs the surface of the appearance of stone or masonry. Linseed oil has water-absorbing, and lacks water-resisting, properties. It cannot be applied over a damp or wet surface, which means that following a rainstorm or rainy season a painter must wait weeks and perhaps months before he can commence work on or complete a contract already begun.

A series of practical tests developed the fact that a wash of zinc sulphate or ammonium carbonate was a help in some instances, but the lack of uniformity in results, and low degree as well as non-permanency of improvement, demonstrated their inefficiency to cope with this important problem.

Before passing this phase of my subject, I want to say that the above is intended as no adverse criticism of the master painter or chemist recommending the use of these treatments. On the contrary, the master painter is to be commended for his wisdom and research in figuring out, in the absence of anything better, a method or process that helped, in a measure, at least, to overcome the difficulties confronting him.

Third—Colorless liquid coatings.

Certain of these may be of some value or service in retarding moisture, absorption and efflorescence, but they are all alike found lacking in the following respects:

They serve to emphasize any defects in, or difference in, color of concrete construction.

They impact to concrete a soggy, water-soaked appearance.

They do not render impermeable to moisture for any length of time.

They do not decorate.

Fourth—Paint for concrete:

Paint Required and Its Properties

If there is any truth or logic in the foregoing, it would appear that we need, and the building trades demand, a paint peculiarly adapted to the coating of concrete surfaces. The requirements of such a paint must be exacting, and from my study of this question I conclude that such a paint to meet the needs must be—

A durable protection, resisting disintegration of concrete by the elements.

A preventive of dampness through resistance to water and moisture.

A paint that can be applied directly to the concrete surface without any previous treatment.

This paint must be economical.

After weathering, it must offer a good surface for repainting.

It must be adapted to receiving and holding a plaster coat.

It must be so constituted that it will be artistic, appropriately pleasing to the eye.

Its consistency and nature should be such that it will spread easily, work well under the brush, penetrate the voids, fill and cover hair cracks, and act as a bond of connection between the concrete and succeeding coats. Not only must it penetrate and fill up the voids, but it should, in a measure, level up the rough portions of the surface.

It must be suited to painting over damp and wet surfaces and dry even when surrounded with moisture. When dry it must adhere to the surface, be sufficiently elastic to conform to changes in temperature, and remain hard in the presence of moisture or water.

A paint composed of both pigment and vehicle in a paint for concrete is a very immentally affected, physically or chemically, by the liberated calcium hydroxide.

As in all paints for wood and iron, the vehicle in a paint for concrete is a very important factor. It must not be linseed oil, blue, casein, or any other substance with like characteristics. It should be difficult of saponification, and of low saponification number. I am convinced that some kind of varnish product, peculiarly adapted to the purpose, is required.

The pigment, as in linseed oil paint, has its function to perform. In opposition to a theory advanced by some, I am going to say that this pigment should not be cement for reasons that are self-evident and self-apparent. It must be, for the first coat, at least alkali-proof. Not only must it decorate, but it must protect the vehicle, and, in conjunction with the vehicle, the surface coated.

A paint consisting of both pigment and vehicle working in unison, with the minimum of opposing forces, favorable of application, serviceable under exposure, resistant to water and moisture, economical to the consumer, is necessary to perform the function, to meet the need, to fulfill the requirements of a paint for concrete.

Cracks in Concrete*

CRACKS in concrete are unsightly but not necessarily dangerous. They may be classified under two heads: Surface Cracks and Body Cracks.

Surface Cracks—These are often referred to as "hair cracks" by reason of their fineness and semblance to hairs, and occur in both plain and reinforced concrete. They are also known as "crazing," and are of very frequent occurrence. They appear to arise from the surface skin of cement mortar being richer in cement than the mortar of the body concrete, thus exposing almost a neat cement skin, which expands, on exposure to the sun's rays, at a different rate from that of the body concrete. This is worse upon the uppermost face in a mold, where the lighter and weaker particles of cement work up to the top and form a skin known as "laitance." If work be kept under water, and sometimes if shielded from the sun, this crazing may not occur. To overcome its unsightliness, the surface skin should be removed either (1) by brushing the concrete, when green, with wire brushes; (2) by rubbing with a stone or piece of concrete and sand and water; (3) by dressing with hand-operated or pneumatic chisels and hammers; or (4) by brushing the surface with hydrochloric acid, and subsequent washing with clean water. The last two named methods are best with completely hardened concrete.

Body Cracks—Cracks extending through the body of concrete may be ascribed to the following:

1. Faulty design and construction so far as statical resistance is concerned.
2. Expansion of cement or concrete.
3. Corrosion of embedded steel.
4. Shrinkage from setting and hardening in air.
5. Difference of temperature in different parts.

Faulty Design or Construction

Under this head the following causes have been noted:

(A) Settlement of the foundations.

(B) Too high a stress in the reinforcement, resulting in excessive deformation.

(C) Too thick a covering of concrete, in particular where the effective depth of beams is very small.

(D) Too early removal of forms. The age of the concrete when the forms are removed must be sufficient to give the usual factor of safety due to the stresses caused by dead load and such accidental load as may at that time be anticipated. Generally the following recommendations are made, subject to the approval of the engineer or architect responsible for the work:

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*Abstract of report submitted to the British Concrete Institute.

For mass concrete walls not subject to thrust, and where the height does not exceed 2 feet, the forms should not be removed under 24 hours. Where the wall is subject to pressure, forms should remain in place at least a week, although a fortnight is preferable. For mass concrete arches of more than 20 feet span, one month is recommended.

For reinforced concrete the following practice is recommended: Slabs, a minimum of 7 days; but otherwise, for slabs carrying only their own weight, an allowance of 2 days per inch of thickness, or 1 per foot of span, whichever is the greater. For sides of beams, walls, and columns not under side thrust, a minimum of 4 days; bottoms of beams, a minimum of 2 weeks, though a month to 6 weeks may be necessary under special circumstances. For arches, the time of removal of the centering is better left to the judgment of the engineer, keeping in view the ratio of rise to span and special circumstances.

If it is intended that the structure shall be used for carrying heavy weights, emergency props should be left in for such time as the engineer or architect may direct.

The foregoing periods to be increased by at least the time during which frost or rain has intervened.

(E) Defective design of forms with inadequate allowance for contraction and expansion due to variation of moisture. Dry timber may expand and crack the concrete unless wetted beforehand.

(F) Careless removal of forms, which may result in cracking the concrete by shock of falling timber, or by levering and pressing on the green concrete.

(G) Vibration, resulting in deficient adhesion and excessive deflection. Forms should be very rigid.

(H) Insufficient allowance for continuity, fixity, and general monolithic nature of concrete work done in situ. Over supports, the maximum degree of continuity and fixity should be provided for. Frequently cracks will be found over supports of continuous reinforced concrete beams and floor-slabs, owing to the omission or insufficiency of steel there. Concrete floors are often built in chases in walls and carried over walls, others standing above; and sufficient fixity is given to cause cracks, if provision has not been made in the reinforcing. Columns and piers, when built monolithic with beams, will give more or less fixity to end of beams resting thereon, both at end and intermediate supports.

(I) Too close spacing of steel, so that there is no room for the concrete to get round and adhere or bond with the bars.

Expansion of Cement or Concrete

Under this head the following causes of cracking are noted:

(A) Over-limed and coarsely ground cements, which were frequently met with years ago, caused expansion, to overcome which it was necessary to leave room for expansion—i.e., expansion joints. Especially was this precaution adopted around the edges of floor-slabs adjoining walls.

(B) Coarse materials containing sulphur compounds, unburned fuel, oxidizable or hydratable iron compounds, unslaked lime, and other deleterious substances. Breeze, clinker, and slag frequently contain sulphur and metallic iron or oxide of iron, while boiler ashes may contain both sulphur and unslaked lime (the latter derived from limestone in the coal). Some bricks contain sulphides and sulphates and lime, and should not be used broken for concrete. Old bricks also sometimes have old plaster adhering to them; the sulphate of lime may cause no trouble in plain concrete while it is kept dry, but, in the presence of water, reacts chemically with the aluminates of the Portland cement, forming sulphoaluminate of lime, which is attended by increase in volume, and may cause blowing if in large quantity, and even a small quantity may result in cracking. Free lime in the same way will swell or contract with water. Black magnetic oxide of iron will become converted into hydroxide of iron in the presence of moisture. Indeed, any iron compounds are dangerous in reinforced concrete as likely to react electrolytically with the steel in the presence of moist air or dampness; and sulphur causes speedy corrosion.

Corrosion of Embedded Steel

Should the steel in reinforced concrete corrode by reason of porosity of the concrete or the presence of deleterious substances in the coarse materials of which it is made, or by electrolytic action, the concrete cover to the bars will crack and burst off.

Shrinkage from Setting and Hardening in Air

This is probably the most frequent cause of cracking. Concrete will expand slightly in water, and contract on drying out, so that cracking is frequently not evidenced from this cause until the concrete is allowed to dry, which requires a period varying usually up to two months; and in thick mass walls, moisture and heat are retained for a long period, and may delay cracking up to six months and even longer. It is usual to keep concrete wet for several days after manufacture, in order to ensure it gaining maximum hardness; and it is specially important to prevent rapid drying by sun and wind, so that the surface of concrete should be shielded against such exposure. A dry mixture of concrete shrinks less than a wet mixture, and concretes richer in cement contract more than lean mixtures. or reinforced concrete work, medium wet mixtures are desirable, and therefore concrete richer in cement than 1 to 5 is not advisable for curtain walls. The coefficient of contraction of concrete on exposure to air appears to be about 0.0002 to 0.0005 at one month, and increases to about 0.0004 to 0.006 at 1½ years. The variation recorded is between poor and rich concretes. Such contraction is usually prevented from taking place uniformly throughout; in retaining walls and pavings, it is prevented by friction of the soil; in other cases, by the holding of other parts. Plain concrete will usually hold together for some distance, so that contraction joints need be inserted only at intervals. The following are advised as suitable distances apart of such joints in plain concrete: Paving, 4 to 5 feet; curtain walls, 10 feet; exposed retaining walls, 15 to 20 feet; basement retaining walls (not exposed) and dock walls or dams, 50 feet.

If curtain walls adjoin heavy columns and beams the rigidity of the latter would probably result in cracking if constructed monolithically, even if reinforced. It is best, therefore, in such cases, to provide joints adjoining beams and columns.

If concrete be laid over the joints of a thicker lower surface of concrete, the joints of the latter will most probably be evidenced in the upper surface.

Large surfaces have been successfully constructed without apparent cracks, by properly reinforcing the concrete and laying all at one operation. The object of the reinforcement is to break down the tensile resistance of the concrete, and cause it to crack uniformly at such close distances as to render the cracks invisible to the eye. If one portion of the concrete be left over-night, great care should be taken to roughen the hardened surface by tooling away; then clean by brushing with water, and apply half an inch of mortar of the same proportion as the mortar in the concrete, and ram the fresh concrete well against it. Such joints will often show, even though well reinforced. In calculating the amount of reinforcement for such purpose, the ultimate tensile strength of the concrete at one month should be equated to the resistance of the steel at the yield-point. Usually, for a 1:2:4 concrete, ½ per cent. of steel is required each way, the bars or meshwork being laid at right angles. The reinforcement should be in small sections and well disseminated through the thickness of concrete, and a layer of bars should be near each face. So-called "distribution bars" near the bottom of floor-slabs are not sufficient if cracking is to be resisted; rods should also be placed near the upper surface. Cracks frequently occur parallel to rods where "distribution bars" are not used, and also occur at right angles to main bars where continuity bars stop; top reinforcement would avoid this. Contraction reinforcement should be in addition to the section of steel required to resist static forces.

The sudden drying-out when heating apparatus is installed, frequently causes excessive cracking.

Difference of Temperature in Different Parts

Considerable difference of temperature will cause cracking, and should be avoided as much as possible. Heavy reinforcement is not always an effective preventative. Most reinforced concrete chimneys in which the internal temperature is over 500 degrees F. seem to be cracked vertically, externally, and often horizontally as well, though possibly the latter could be avoided. This cracking is probably due to the difference in temperature between the outside and the inside, which may be considerable with a cold wind blowing. A continuous lining, with cavity between it and the outer shell, would probably prevent serious cracking.

Recovering Waste Foundry Sand

In the past two years, says the Iron Age, a number of plants in different parts of the country have attempted to recover the values in waste foundry sand. Both dry and wet processes have been used in experimenting. No one manufacturer makes all the equipment necessary for a complete plant of this kind, and this has delayed the development of the best methods. On July 15th a group of Detroit foundrymen met to discuss this problem. A number of them had already had conferences with equipment manufacturers, and the result is that a series of tests will be undertaken, financed by foundrymen in different parts of the country and by the manufacturers of equipment. A complete plant for treating sand either by dry or wet process, for rebonding old sand for use as moulding sand, and for the treatment of new sand to increase its value will be erected in the laboratory of the H. M. Lane Company, Detroit. It will have a capacity of about 15 tons of sand per day. The tests are expected to take five or six months. It is stated that preliminary tests seem to indicate that 70 per cent. of the old sand now being carried to the dump can be recovered and re-used.

Filtration Costs

Filtration costs at Wilmington, Del., amounted to $1,821 per million gallons during the year ended June 30, 1912, according to the report of Mr. John A. Kienle, at that time chief engineer of the water department. The water is taken from Brandywine Creek pre-filtered through sponge clippings and passed through slow sand filters washed by a Blaisdell machine. With a population of 90,000 the per capita daily consumption was 124.7 gal. Preliminary filtration for 4,111,700,000 gal. cost $0.375 per million gallons. Slow sand filtration for 4,012,800,000 gal. cost $0.916 per million gallons, and laboratory charges were $0.530 per million gallons. These figures are gross operating costs and do not include interest and depreciation on plant investment. The slow sand filters were operated at an average rate of $5,400,000 gal. per acre. The hand rakings of the surface of the filter beds employed during the previous year with such good results were abandoned during the past year, and the beds were raked mechanically with the washing machine. At first, four ordinary farm cultivator teeth were attached, but later the regular machine teeth were used.

If we bear in mind the many difficult problems and the great cost involved in changing from steam to electric operation on railways, it must be admitted that great strides have been made in this direction. A recent estimate places the total number of miles of single track that have been changed from steam to electric operation in America at about 1,600 miles, and the same authority finds that approximately 1,500 miles of single railway track will probably be subjected to the same change during the next few years.

A 192-ft. span, single-track railway lift bridge, with a maximum clearance of 55 ft., has recently been built over the Mississippi River for the Chicago Great Western Railroad. It replaces a 412-ft. drawspan built in 1885 and reinforced in 1910 and is of the Waddell-Harrington type, with 225-ton concrete counterweights. The Widell Company and the American Bridge Company were the contractors for the substructure and the superstructure respectively, which were built under the direction of Mr. L. C. Fritch, chief engineer, and Mr. C. Chandler, engineer of bridges.

Trackmen as judges of track are used to determine the awarding of prizes for the best maintained sections on the Norfolk & Western Railway. Mr. Charles S. Churchill, chief engineer, and retiring president of the American Railway Engineering Association, spoke of the system in his opening address at the recent convention of the association. The sections are judged by foremen and supervisors from entirely different divisions, and Mr. Churchill stated that these men, due to the fact that they are acquainted with the requirements, make wise selections in the awarding of the prizes, and that at the same time the judges get valuable ideas from their inspection trips.

The Value of System in Contract Work

Details of Organization Which Make for Success—Advantage of Timing Construction—Suggested Form for Sub-Contracts

By G. D. Crain, Jr. *

HOW does a successful contractor plan his work—by days—by weeks—by jobs? To tell that, in detail, is itself a pretty big contract, and isn't the easiest thing in the world to do; but I have handled a few big contracts in my time, and this may not be too difficult.

I am the senior member of a more or less successful contracting firm in a certain good-sized city on the Ohio River; and while we haven't got everything figured down to the finest possible point, yet there are a number of things which might be said to constitute our system, our plan of doing business, and which we never deviate from.

To begin with, the work is divided between my partner and myself, according to that which we can do best. He is possibly the better superintendent, and he therefore attends to all of the outside work, making the round of all jobs which we have under construction, seeing that material is on the ground and the like—all the numerous details that come up and have to be seen to, in spite of the fact that we have a capable superintendent. I handle the office, making up estimates, attend to the payment of bills, the correspondence, and all that sort of thing. And we are both kept busy enough, too. I don't mean that I never oversee any of the work, nor that he neyer makes a contract or helps figure an estimate on a job; but I do mean that we make it a point not to be on the same job, at the same time—that's where the system comes in.

We figure that one of us can do a thing, in most cases, just about as well as both of us together could do it, and that it would therefore be poor business to waste the time of one of us helping the other do a thing which he could do alone. The only exception to this is one hour of the day—the noon hour. We make a rule to lunch together whenever it is practicable, because we have found it a good idea to get together at that time, when things are somewhat relaxed, and have a talk while we eat. It's a good time to untangle little matters that have come up, and then each can get any advice he wants of the other. It's a sort of council of war, where plans can be laid and courses of action decided upon, whenever necessary; and we both go back to work feeling that we are not alone—that we have a good man behind us!

Then, we always save some time that others waste, not to mention incidental damage to materials, by not being in too much of a hurry to start on a job. That may sound somewhat peculiar, but it is the exact idea I want to convey. Very frequently, in fact, nearly all the time, as soon as the plans and specifications are complete and the contract is made, the owner is in a wild rush for the work to begin. He sees no reason for an instant's delay, and is utterly unable to understand why the fool contractor stands around with his hands in his pockets and waits for days, and possibly weeks, before beginning the job.

The point is, of course, that we are not standing around with our hands in our pockets, by any means. Why begin excavation on a medium-sized or small building in such time that it will be finished long before your foundation material could be on hand, and be caving and possibly filling with water in the meantime? Or, what is more usual, why complete your foundation, and have your basement open to the weather, before you have completed arrangements for the delivery of frames, so that the job can go right on up? The same thing applies where there is any particular kind of brick to be used, especially, of course, if it is in the nature of a special order. And millwork should be ready at the time when it is needed, in order to prevent delay in the work, having men on your hands idle half of their time. That sort of thing eats into profits, and is entirely useless. A little foresight is all that is necessary. The delivery of every scrap of material can be arranged for in advance, to be on the ground just when it is necessary, according to a definite program; and yet I have seen builders who neglect this first essential to a successful job.

Where the material required is such that it has to be ordered specially, and always where it must come from out of the city, I take particular pains to see that there will be no hitch in delivery—that is, none that will leave me without legal recourse. If it is a small quantity, I usually order it at once, and have it delivered, as the certainty of having it on hand makes the immediate investment worth while. If it is a large quantity, however, I make a formal contract, and have a penalty clause just like that which is contained in our contract with the owner, so that if the factory, or quarry, or whatever it is, falls down on its contract, we are protected.

It goes without saying that we have at hand on each job complete detailed plans and specifications, ready for reference all the time. In addition to these, however, we also have a complete set of the subcontracts made, so that the superintendent and foreman on the job can at once ascertain what sub-contractor is responsible for any part of the work or material, at any time the information becomes necessary.

A Suggested Form

Our sub-contracts, by the way, are made up on a form which we have devised, which we think is pretty good. On one side we have a short proposal blank, running about this way, with date-line and address:

Gentlemen:

We propose to furnish all materials and labor and do the........... for the........... job, or building, located on .... street, between .... and .... streets, being No. .... in the City of ...., County of .... and State of ....; said work and materials to be in accordance with the plans and specifications as prepared by ...., Architect, and in order that there may be no misunderstanding, we will further state [Here is a blank space for such further remarks as may be deemed necessary.] For the sum of .... Dollars.

We agree, upon written notice from you, to start the work within .... days after the receipt of said notice, and push said work to completion as rapidly as possible.

The blank has space for the sub-contractor's signa-

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* In The National Builder.

ture and an acceptance line for us. On the other side of this form are eight ruled spaces, all just alike, under the following printed lines:

"Received of (our firm) partial payments on account of work and material as per contract on the reverse side as follows:"

And in each space is room for the date, signature of the firm, and the amount of the partial payment. At the bottom is a slip, which can be detached by a perforation, in which to sign a receipt and release in full, when all payments are made. The detailed statement of partial payments is filed alphabetically under the name of the sub-contractor, with all other matter relating to his contract, and the slip is turned over to the owner, or placed in his file, as evidence that the property is clear of liens on the part of sub-contractors.

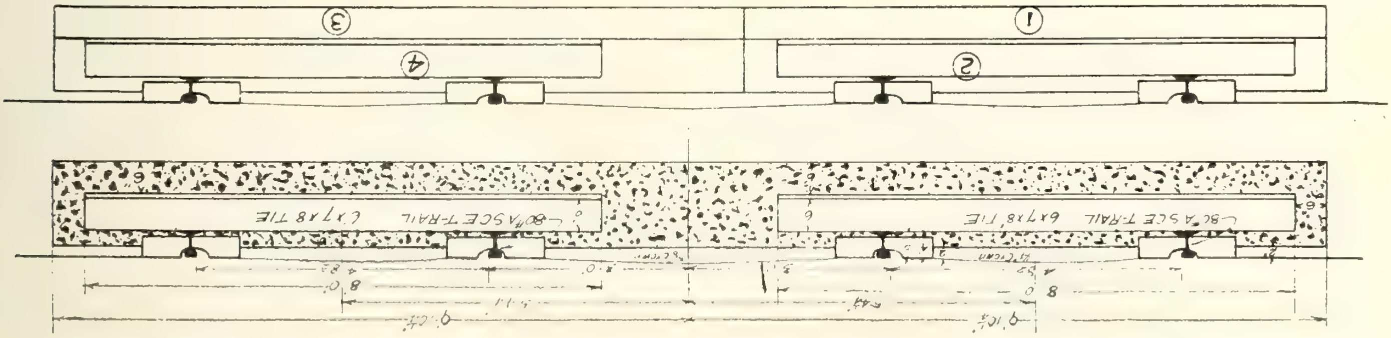
It might be mentioned here that there is but one check-book out of which drafts are made on the firm account, and that is kept at the office. Our pay-roll, of course, is handled by one check, and the men get their money in cash, in the usual pay-envelope. I have known contracting firms, though, who never knew where they stood on a job, because two or three members were issuing checks here and there, and it was simply impossible to keep any track of them.

We do not keep a permanent crew on hand, work or no work. I have known of contractors who do this, but we have never found it necessary. We usually have plenty of work for our good men, and have little trouble in keeping them busy; but in times of slack work, we let them off in the reverse order of their value to us; and I have seen the time when we have as many as three or four foremen working on one job—not as foremen, you understand. They were all practical mechanics, and in order to keep them busy we would simply place them on the job as journeymen. And if we came across a foreman who was too proud to work that way we would immediately fire him, because we have no use for such examples of the artistic temperament in the building business.

We have a bookkeeping system which enables us to know to a cent what a job has cost us, and that is considerably more than some men know; and yet it is absolutely necessary, in order for the contractor to find out what his profit—or loss—is, as the case may be. We have three ledgers, in one of which is recorded all that we buy, with the credits to us by return of material and cash payments; in another, the materials put into the job, and payments made to sub-contractors for work and material; and in the third, our accounts with the owners. There are appropriate accounts in the first two ledgers for every head under which expenditures on a building can fall, and not a cent is spent for even carfare that it not properly charged. When we get through a job we know just what we have spent, and we know just what we have spent it for; we know what we have received in payment for the work. And from these facts, it isn't hard to discover just how we stand on the job.

Track Construction in Calgary

The accompanying reproductions show the standard double track construction on paved streets of the city of Calgary's municipal electric railway system. This system now uses an 80-lb. A.S.C.E. rail, though previously they used a 60-lb. and 80-lb. Lorain I.T. rail. It was found, however, that these cost three or four dollars a ton more than the ordinary A.S.C.E. section. The rail block being used this year is a hard silicious sandstone which is set on a dry sand and cement cushion and then grouted. The plan followed is to lay the sub-base below the ties first and, when this is thoroughly set, to lay the track and bring it to line and grade by tamping sand under the ties. When this is completed the balance of the concrete is poured and the rail block set, the asphaltic concrete surface being then laid in the usual manner. A heavy joint is being used this year which goes below the flanges of the rail and is bolted through the web. In the past they have had considerable trouble with joints of the Calgary railway system, but they hope that this year's construction will overcome all difficulties. In previous years the concrete for the sub-base has not been laid separately—from the balance of the concrete—but the ties have been supported in position on blocks and the concrete poured right around them. In some cases this has given very satisfactory results, but in others, as already noted, the joints have shown signs of giving way, probably due to the pounding of the cars before the concrete had become very hard. A number double 4/0 bond at each joint with cross bonds about every 250 feet has been used. The intersection work has been supplied by Hatfield of Sheffield, the United States Steel Products Company, and by the Montreal Steel Works. Both the solid manganese steel and the manganese insert construction has been found satisfactory. This year they are having the tongues on the switches supplied with a double groove which promises to be very much more satisfactory than the older type narrow tongue switch, the narrow tongue, even when made in manganese steel, being very liable to get bent. Calgary's city engineer is Mr. Geo. W. Craig, and the superintendent of the street railway system is Mr. Thomas H. McCauley.



Standard section of Calgary's municipal street railway double track—Lower figure shows order of placing concrete.

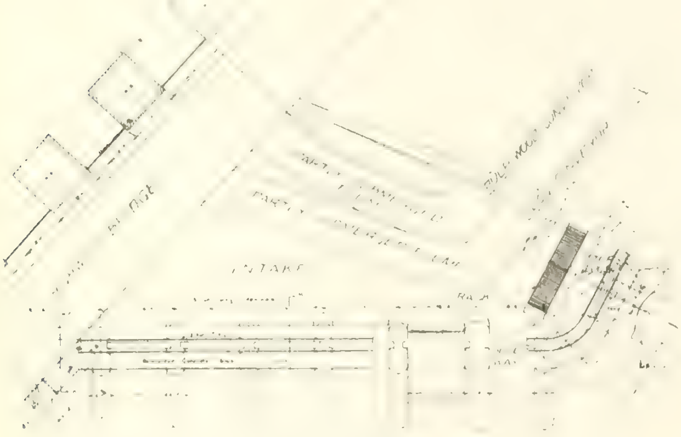
Hydro-Electric Development at Dryden, Ont.

A hydro-electric development of 2,000 horse power capacity has just recently been completed for the Dryden Timber & Power Company at Dryden, Ont. The power will be used for operating sulphite pulp mills of this company and for supplying light and power to the town. The plant is situated on the Wabigoon River at a point about one mile below Lake Wabigoon, and just opposite the town of Dryden, which is half way between Port Arthur and Winnipeg on the main line of the Canadian Pacific Railway.

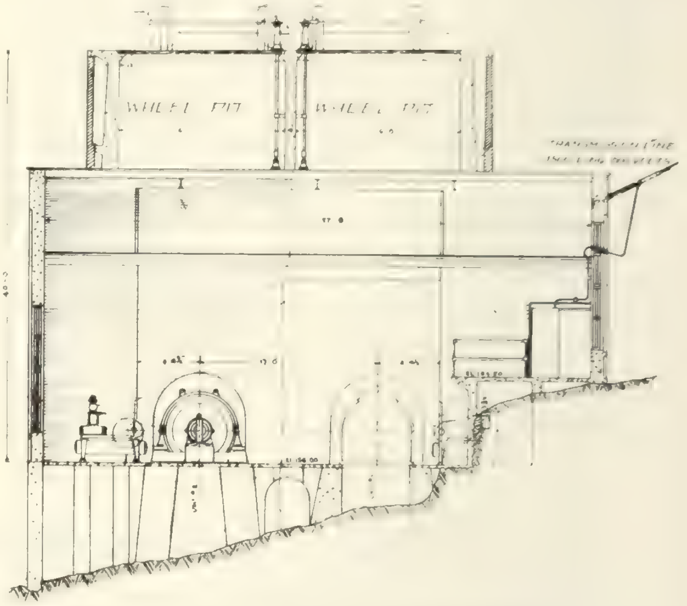
Lake Wabigoon has an area of some 60 square miles and constitutes a very desirable reservoir for this power development. The water shed area feeding this lake is in the neighborhood of 800 square miles. The river flow is about 400 c.f.s. The development is the result of utilizing three distinct falls which, in a distance of 1,600 feet have a total drop of about fifty feet.

The dam is of concrete, 120 feet long by approximately 25 feet high. It consists of a series of piers placed 16 foot centres with concrete spillways and stop logs between and with reinforced concrete slabs across the top, over which the winches operate on a built-in track. The dam is built at an angle across the river, providing ample spillway area to take care of surplus water in time of flood. A sluiceway is provided which can be opened to the full depth of the dam in case of extraordinary flood. The small forebay formed by the dam, diminishing in width towards the mouth of the pipe, serves also as an approach for the saw logs and pulp logs to the mill.

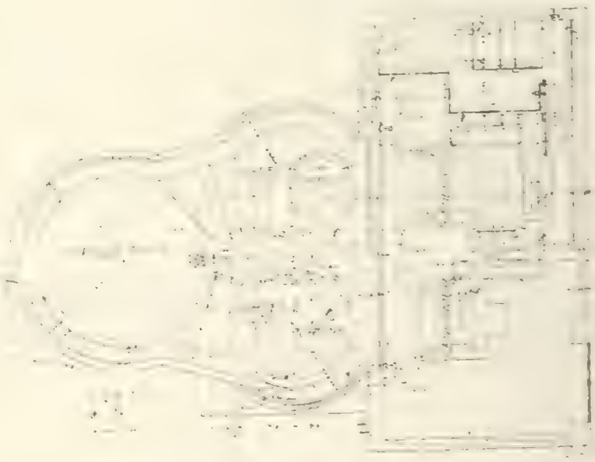
Just above this forebay the river widens out into a small lake which is part of Lake Wabigoon, and the entire season's cut of logs both for pulp and for lumber and ties is assembled here in booms. Across the entrance to the forebay is a series of cribs to which are attached the various booms by which the logs are controlled. Two partly submerged flumes, one for pulp logs and one for saw logs and ties, lead from this line of cribs, through the forebay, to chain conveyors situated near the entrance to the pipe, which lift the logs from the water and carry them to the mill. These flumes serve to guide the logs, and to keep bark and sticks or small pulp logs from approaching the racks. A steel thimble set in the concrete connects the dam with a wood stave pipe 1,500 feet long and 9 feet inside diameter. Stop logs and racks are, of course, placed in front of the pipe mouth. The pipe line is constructed of 4-in. x 8-in. B. C. fir, bevelled to shape. The bands are of 3/4-in. steel, spaced 9-in. apart. The pipe line is supported on wooden blocks spaced about 10 feet apart and for a distance of 200 or 300 feet rests on a wooden trestle at a height of 12 or 15 feet. In passing under the C. P. R. embankment a reinforced concrete pipe is substituted for the wood stave. The wall of the concrete pier is 12-in. thick, treated both inside and out with a waterproofing compound and a coating of asphalt. The pipe is laid on a grade of 0.266 per cent. sloping towards the power house. The design of the power house is shown in the accompanying figures in both plan and cross sections. An important feature is the surge tank and the two open wheel pits designed to secure good regulation. The tank and the wheel pits are built of reinforced concrete and are circular in shape, the surge tank being 22 feet diameter, and the wheel pits 16 feet each, grouped as shown in the drawing. Owing to the circular form of the tanks, there is no bending moment in the walls, and the stresses due to the head of water are taken up by



Dam, sluice-way, intake, submerged conveyors, etc.



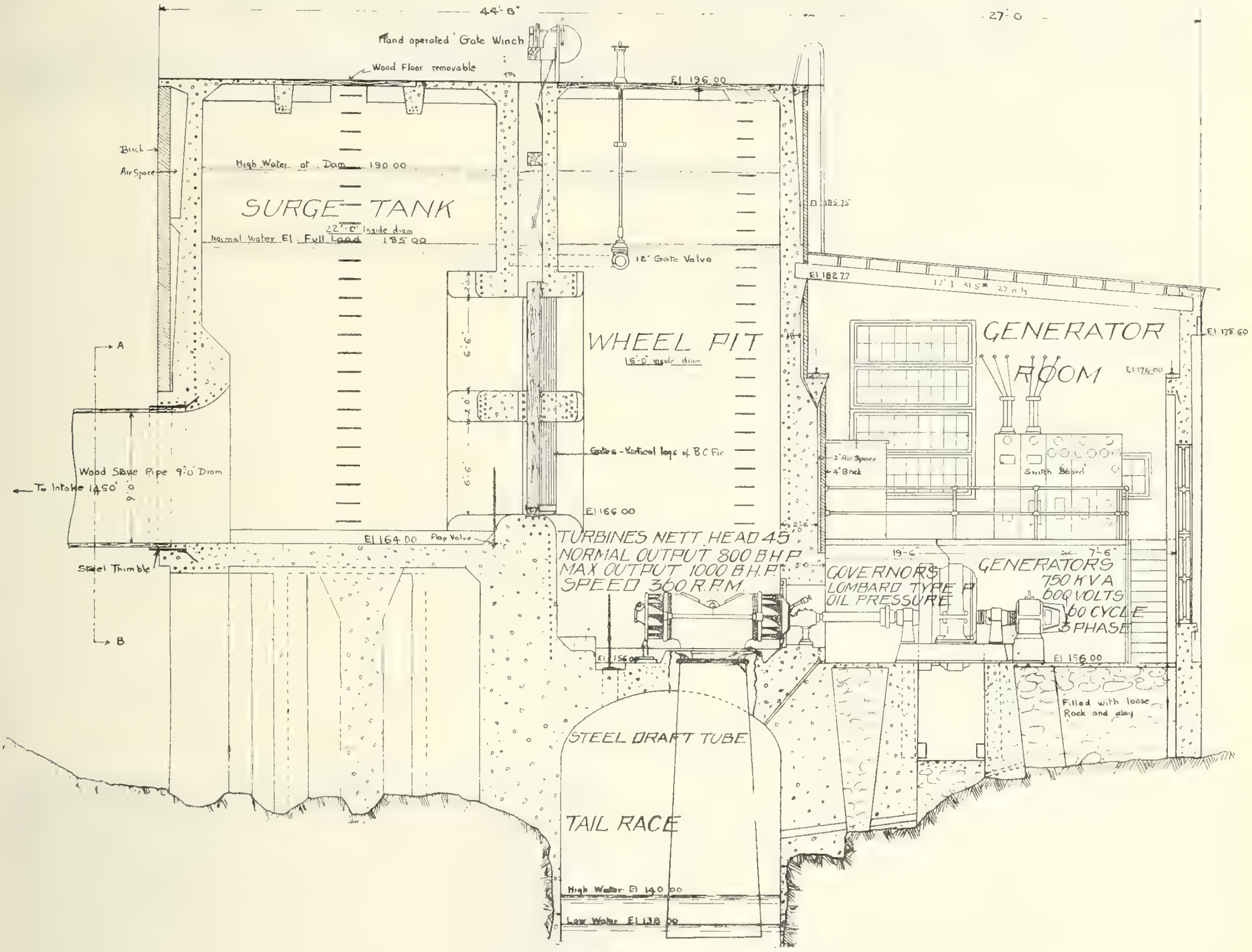
Section of power house through generators.



Showing general plan of Dryden power plant.

direct tension in the reinforcing steel, the concrete serving merely as an envelope to contain the water. This form of construction takes considerably less concrete and reinforcing steel than would be required in rectangular tanks. The walls of the tanks are 24-in. thick at the bottom and 12-in. at the top and 40 ft. in height. The velocity of the water entering the wheel pits is about 2 feet per second. The wheel pits may be isolated from the surge tank by the lowering of wooden gates composed of vertical timbers operated by hand winches.

The turbines are placed on the floor of the wheel pits which is about 18 feet above extreme low water and the water is carried off by two steel draft tubes which empty into the same tail race above which the wheel pits are supported on a concrete arch.



Cross section showing surge tank, wheel-pit, turbine, generator, draft tube, etc.

The turbines, of which there are two, are of the Francis twin central discharge open flume type, each designed for a working head of 45 feet and capable of developing 800 B.h.p. with a water supply of about 190 c.f.s. at 360 r.p.m. The turbines have a maximum capacity output of 1,000 B.h.p. Each unit is provided with two runners constructed with buckets of heavy flanged mild steel plates cast into a centre boss and surrounding ring of cast iron. Each runner is mounted inside a cast iron guide casing provided with a set of cast iron adjustable guide plates fitted on steel spindles. of cast iron adjustable guide plates fitted on steel spindles. The turbines are mounted on a cast iron sectional type central discharge casing provided with two large manholes fitted with covers for giving access to the runners and fitted with heavy cast iron foundation plate for setting in floor of turbine pit. Each turbine is fitted with a rivetted steel tapered suction tube 16 feet long with flange on the upper end for connection to the foundation plate and bell-mouthed at the lower end.

The governors are of the Lombard oil pressure quick acting returning relay type, complete with pressure and exhaust tank relay valve, main controlled cylinder, etc. They are fitted with high speed sensitive governor heads with suitable balanced piston valves for operating the relay valves and are of ample power to operate the regulating guide blades in the turbines. The governors are capable of controlling the speed within the following limits:—

Ordinary gradual load changes—speed variation not to exceed 1½ per cent.

Twenty-five per cent. sudden change of load—speed variation not to exceed 3 per cent.

Fifty per cent. sudden change of load—speed variation not to exceed 6 per cent.

One hundred per cent. sudden change of load—speed variation not to exceed 16 per cent.

The fly wheel effect of each generator is 1,000 ft. tons at 360 r.p.m.

Two sets of independent triple oil pumps are provided for operating the governors, each arranged for belt driving from the turbine shaft and each set of sufficient capacity

Dryden power house—discharge side.

Intake side, also showing 4-pole tower.

for the proper operation of the two governors, if required.

The turbines are guaranteed to develop not less than a maximum of 1,000 B.h.p. each under an actual working head of 45 feet at 360 r.p.m., the efficiency of the turbines to be as follows: full load 81 per cent., 7/8 load, 85 per cent., 3/4 load 83 per cent., half load 75 per cent.

The generators are 3-phase, 60 cycles, 600 volts, 360 r.p.m., 750 kv.a. each, of the revolving field water wheel type. They are constructed on cast iron bed plates with two main pedestal bearings provided with ring lubricated bearings. Each generator is guaranteed to develop its rated output continuously with a temperature rise not exceeding 40 degrees C. and of developing 25 per cent. overload continuously with a temperature rise not exceeding 50 degrees C. and of developing 50 per cent. overload momentarily without danger. Each generator is provided with a direct-coupled exciter mounted on an extension of the main base plate, each exciter being large enough to feed both generators at full load. The efficiency at unity power factor is guaranteed as follows: ¼ load, 83.4 per cent.; half load, 90.5 per cent.; 3/4 load, 92.7 per cent.; full load, 93.5 per cent.; 1¼ load, 93.8 per cent. The regulation at unity power factor is 8 per cent. and at 80 per cent. power factor is 16 per cent.

The switchboard consists of five panels of black enamel slate mounted on an iron frame work. The two generator panels are each fitted with three ammeters; one triple pole oil break switch fitted with two maximum over load trip coils; one set of synchronous plugs; one set of volt meter plugs; one integrating watt meter; one double pole field switch and one alternator field regulator. The exciter panel is fitted with a volt meter; two sets of volt meter plugs; two double pole exciter switches; two field rheostats; one lighting switch; two ammeters. The two feeder panels each carry one ammeter and one triple pole oil break switch fitted with two maximum over load trip coils and one no-volt trip coil. A swinging bracket fitted on the end of the switchboard carries a rotary type syncroscope, a busbar volt meter, an incoming machine volt meter and a frequency meter. The board also carries a recording watt meter of the unbalanced load type.

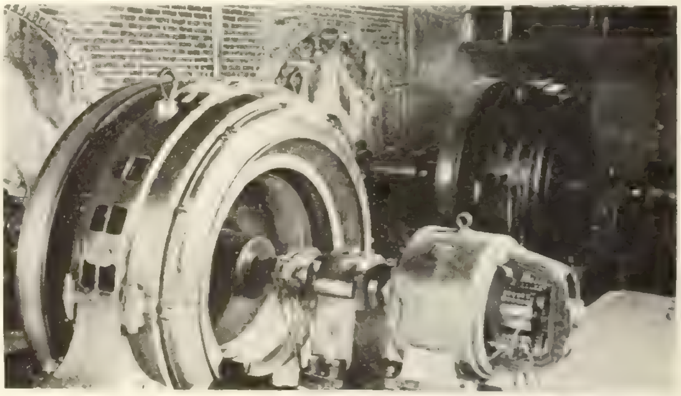
On account of the comparatively short distance between the pulp mill and the power house, it was not advisable to step up the voltage and energy is therefore transmitted at the generated voltage of 600. On this account very large cables are used. These are of aluminium, 960,000 circular mils in cross section. There is a double 3-phase circuit carried on a two-pole line. At certain points where terminal towers are required, these are of the four-pole type. Poles are spaced approximately 90 feet apart.

The sub-station equipment consists of a distributing board of enamel slate fitted with 800 ampere, 3-pole, slow break knife switches for controlling the lines from the power house. From this switchboard four circuits are distributed, each fitted with one ammeter and a 3-pole slow break knife switch. Choke coils and lightning arresters are also supplied at this point for each of the six lines.

The distributing cables run on porcelain insulators, a distributing box being provided at every junction, these containing switch fuses, one set for each motor. These fuses set very high, being chiefly intended for protection against line troubles, each motor starter being provided with no-volt overload features to care for ordinary overloads.

The motors used to operate the various equipment throughout the mill vary in size from 7 to 250 h.p., 31 motors in all being installed. The various motors with the uses to which they are put are as follows:

One 7 h.p. for conveyor; four 7 h.p. for pumps; two 8 h.p., conveyors; three 10 h.p., recovery pumps; one 13 h.p., chip conveyor; one 20 h.p. boiler feed pump; five 25 h.p., barkers; one 25 h.p., liquor pumps; one 50 h.p., main water pump; one 50 h.p., induced draft fan; one 50 h.p., pulp wood conveyor; one 75 h.p., line shaft; one 90 h.p., screen room; two 90 h.p., recovery room; one 90 h.p., slasher; one 90 h.p., hog; one 180 h.p., beater room; one 150 h.p., conveyor and pump; one 250 h.p., saw mill.

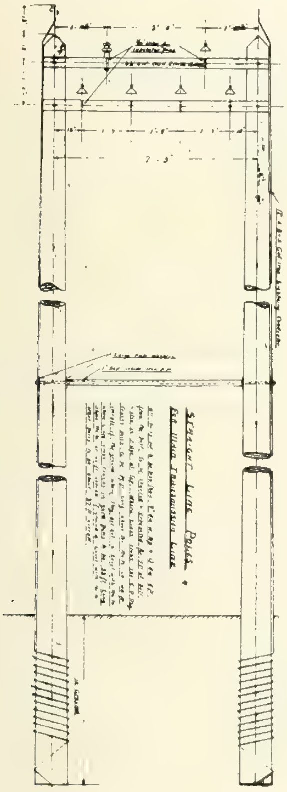


Two 700 kv.a. generators, with exciters.

Of these motors the two largest are the wound rotor type, but all the others are squirrel-cage motors.

The various pumps with their sizes and the uses to which they are being put are:—one 1,000 gal. unit for pumping caustic liquor; one 1,400 gal. unit for main water pumping operating at a 105 ft. head; three 450 gal. 33 foot head, caustic liquor pumps; four 375 gal. 25 foot head, pumps specially installed for operating the digesters under 125 lbs. pressure, and one 1,000 gal. boiler feed pump working under a 370 foot head. All the above pumps are centrifugal type and direct-connected to the motors. The main water and boiler feed units are medium and high lift turbine types respectively.

The dam, pipe line and power house were planned and constructed under the supervision of the engineering firm of Harris & Harris, Confederation Life Building, Toronto. Mr. A. L. Cavanagh was resident engineer on the work. The turbines were manufactured by Jas. Gordon & Company, of London, Eng.; the stop-log and gate winches were supplied by the Wm. Hamilton Company, Peterboro. The structural steel racks, etc., were furnished by the Jenckes Machine Company, Sherbrooke; steel pipe bands, by the Steel Company of Canada; governors are of the Lombard type; generators were manufactured by the Lancashire Dynamo & Motor Company, Manchester, as were also the motors. The switchboard is of Ferranti manufacture. The pumps were supplied by W. H. Allan, Son & Company. The supply and installation of the turbines, governors, generators, motors, pumps, switchboards and transmission line were in charge of the engineering contracting firm of Chapman & Walker, Toronto.



Design of two-pole tower.

Railroad Construction in British Columbia

Construction is to commence at once, it is reported, on the 38-mile section of the proposed railroad along the Coquehalla River, from Hope, B.C., to the summit of the Hope range, for the joint use of the Kettle Valley and Great Northern Railroads. This 38-mile road is expected to cost over $3,000,000, part of it exceeding $100,000 per mile. Twelve tunnels are called for in this section of the line, and a wagon road for getting in equipment and supplies is estimated to cost $200,000.

Tenders on the work were opened in Vancouver on August 6 by a board presided over by President J. J. Warren, of the Kettle Valley Railway. Other members of the board were Messrs. A. McCulloch, chief engineer of the Kettle Valley lines, Alex. Stewart, assistant chief engineer of the Great Northern Railway, and J. H. Kennedy, chief engineer of the Victoria, Vancouver & Eastern Railroad and Navigation Company. (The latter is a subsidiary of the Great Northern Railway Company.) It was found that MacArthur Brothers Company, of New York, had submitted the lowest bid, and, it is reported, that the board decided to recommend a contract award to this firm.

It is planned to begin wagon road construction at both ends of the proposed line, and to utilize the 13-mile section of the Kettle Valley line, now under construction by Twohy Brothers between the summit of the range and Coldwater Junction, for bringing in equipment and supplies. The contract calls for the completion of the Coquehalla section before November 1, 1914. Coldwater Junction is the point where the Kettle Valley branch line from Nicola Valley meets the V., V. & E. main line from the Boundary and Okanagan districts.

The new line along the Coquehalla River, which is to be built, owned and operated by the Kettle Valley Lines under an agreement according running rights to the V., V. & E., is the last link in two rail systems which will give direct communication between Vancouver and all of southern British Columbia to the Alberta Boundary line. A steel bridge is to be erected across the Fraser River just below Hope, B.C., to connect the new joint line with the main line of the Canadian Pacific Railway, over which the two companies will have running rights into Vancouver. The point where junction with the Canadian Pacific is effected is 89 miles east of Vancouver.

Progress Reports from Regina

Every effort is being made to complete the various programmes of civic improvement works for which contracts have been let during the present year. The Toronto Street trunk sewer has now been completed on the north side of the railway tracks and the trenching machines have been moved to the south side. It will be necessary to tunnel under the Canadian Pacific Railway tracks, which at this point number about a dozen, and extend for a distance of at least 200 feet. This sewer is a continuation of the big Seventh Avenue trunk sewer. It will reach its terminal at the corner of Toronto Street and Victoria Avenue this year, and will mark the completion of the only double sewer in the city.

Casimir Kocot, the new proprietor of the Regina Brewery, has announced that the improvements contemplated will cost approximately $200,000.

F. G. England will erect a large apartment block at the corner of McIntyre Street and Twelfth Avenue. The ground dimension will be 50 feet by 120 feet. The building will contain all modern improvements, and will be of brick construction. Tenders will be called for within the near future.

Messrs. Storey & VanEgmond, architects, are calling for tenders for the construction of a four-storey boot and shoe factory for W. G. Downing, Limited. The ground dimensions are 50 feet by 113 feet. The building will be of brick construction. It is expected that the cost will be about $50,000.

The Anglicans intend erecting a new church in the North Annex at Regina.

Rae Street Methodist congregation are making arrangements for the erection of a new church edifice at the corner of Ffth Avenue and Montague street at a cost of about $100,000.

Canada's Latent Water-Powers

A Brief Report on the Results of Recent Investigation Work in the Prairie Provinces

By Mr. Leo. G. Denis

During the first part of the year a large amount of time was devoted to a report on the Waterworks of Canada. The information which had already been obtained by correspondence was supplemented and brought to date. In some instances, to accomplish this, it was necessary to visit several towns in Ontario and Quebec and obtain from them data which could not be obtained by correspondence. This report is now in the printer's hands and will be ready for distribution in a short time. It contains a summary description of the waterworks systems of Canada, all arranged for ready reference. A portion of the report is devoted to charts and tables emphasising points of special interest, such as increase in the number of water-supply systems, rates, sources of supply, consumption per capita and sewerage conditions.

Water-Powers of Western Canada

To obtain further information for the proposed report on Western water-powers, a trip was made to the northern portions of the provinces of Alberta and Saskatchewan, to investigate water-power possibilities. The principal rivers travelled over were the Peace, Slave, Clearwater, Methy and Beaver.

I left Ottawa on June 16th and reached Edmonton on the 19th. I found that the Hudson's Bay Company's steamer was only due to leave Peace River Crossing for Hudson's Hope, my first objective point, on July 10th. From Edmonton, where railway travel was abandoned, until the Canadian Northern Railway was reached at Big River, I travelled a total distance of 2,100 miles, of which 1,000 were by river steamers, 850 by canoe, and 250 overland, where the mode of transportation varied from automobiling to footing it behind a team of oxen.

Peace River Canyon

I left Edmonton on June 25th, passing through Athabaska Landing, thence by steamer and stage to Grouard and Peace River Crossing, arriving at the Crossing on July 3rd. I left for Hudsons Hope on July 17th, arriving at the latter place on July 25th. As a very complete survey of the Peace River canon had been made during the previous summer by Mr. G. B. Milligan, it was not necessary to make the proposed survey, Mr. Milligan kindly supplying a plan of his survey. As no levels had been taken, however, the portage was traversed to the upper end of the canyon, aneroid readings were taken for difference of levels and the canyon was explored for a few miles at each end. The descent of the water in the canyon is fairly uniform, except near the head where there is a descent of 25 feet in a half mile. The total descent from head to foot is 225 feet in 18 miles.

Vermilion Fall and Rapid

Leaving Hudsons Hope by steamer on July 27th, Fort Vermilion was reached on August 1st. Here men were secured and on August 5th we started down the river for Fort Smith. Next day the Vermilion fall and rapid were measured. The descent in the rapids is 14 feet, while that in the chute is 12 feet, giving a total of 26 feet in a distance of 1¾ mile.

The Boyer or Little rapid was measured on the 9th, and we reached the mouth of the Peace river on the 11th and Smith Landing on the 13th. During the whole trip from Fort Vermilion we were much delayed by heavy head winds and, at times, had to "track" in spite of the fact that we were

At Smith Landing, I found that, to level the descents between that point and Fort Smith, it was necessary to run the rapids, as, from the Sixteen-mile portage road, the river is inaccessible, except in a very few places. I accordingly hired a local guide and started down the rapids. The channel followed for the greater portion of the distance lies between the numerous islands on the east side of the river and the descent is effected by short pitches, some of which have to be passed by portages. In passing the last pitch of the last rapid, I had the misfortune of having my boat upset, losing several instruments and some personal effects. The whole trip through these rapids, including the time spent in taking observations and levels, took almost two days, after which I returned from Fort Smith to Smith Landing by the portage road.

Rapids of Slave River

The following are the descents observed in each of the five rapids:

Cassette rapid	27 feet
Second rapid	37 feet
Mountain rapid	25 feet
Pelican rapid	10 feet
Drowned rapid	13 feet

The total descent in the 16 miles where these rapids occur, including the swift waters between them, is about 135 ft.

I left Smith Landing by the Hudson's Bay Company's steamer Grahame on August 20th and arrived at Fort Chipewyan on the 22nd. Men with provisions and a canoe, who had been sent from Athabaska Landing by my instructions, were waiting for me. Next day, we started by canoe up the Athabaska river, reaching Fort McMurray on September 1st. On the following day, we proceeded up the Clearwater river and reached Methy portage on the 9th. The Clearwater was metered at the Cascades rapid and the descent in the Cascade, Le Bon, Bigstone and Pine rapids and in the Whitemud fall were levelled.

Rapids of Clearwater River

The following is the descent observed in these different rapids:

Cascades rapid	16 feet
Le Bon rapid	31 feet
Big Stone rapid	6½ feet
Pine rapid	21 feet
Whitemud fall	41 feet

Beaver River

I sent men over to the other side of the Methy portage for a team of oxen to portage our canoe and provisions and, after unavoidable delay, we finally reached the Hudson's Bay Company's post on Methy lake on the 12th and proceeded down Methy lake and river. The rapids were levelled and the river was metered above the mouth of the Whitefish river. We then crossed Buffalo lake and reached Ile-a-la-Crosse post on September 21st. Here, after purchasing some provisions we started on our way up the Beaver river on the same day, reaching the Grand rapid on September 24th, where levels were taken and the flow of the river metered. We continued ascending the Beaver river and by way of Cowan river and lake reached Big river on September 28th. We had to wait until October 1st for a train to take us to Prince Albert, which was reached on the same day. From Prince Albert, I sent the canoemen back to Athabaska Landing and left for Ottawa, where I arrived on October 6th.

The Sterling Telephone & Electric Company, Limited, 200 Upper Thames Street, London, E.C., England, announce that at the end of September they will remove to more commodious premises situated at 209-212 Tottenham Court Road, London, W.C., England.

Architectural Convention at Calgary

The following is the programme of the 6th General Annual Assembly of the Royal Architectural Institute of Canada (Secretary, Alcide Chausse, Montreal), which is to be held at Calgary, September 15-16.

Monday, 15th September, 1913

9.30 a.m.—Registration of Delegates and members at the Headquarters of the Assembly.

11.00 a.m.—Meeting of the Council at the Public Library.

12.30 p.m.—Luncheon offered by the City at Kronn's Rathskeller.

2.00 p.m.—Business Session at the Public Library.

(a) Addresses of Welcome by His Worship the Mayor of Calgary, The President of the Alberta Association of Architects, the President of the Board of Trade and the President of the Builders' Exchange.

(b) Response by Mr. J. H. G. Russell, President of the Royal Architectural Institute of Canada.

(c) Reading of the Minutes of the preceeding General Annual Assembly.

(d) Business arising out of the Minutes.

(e) Registration of the representatives of the various provincial associations of architects.

(f) Report of the President and Council.

(g) Report of the Hon. Treasurer and Auditors.

(h) Notices of Motion.

(i) Lecture by Prof. E. Brydone-Jack, of the Civil Engineering Department of the Manitoba University.

(j) New Business.

(k) Announcements respecting the Assembly.

8.00 p.m.—Annual Dinner at the Alexandra Hotel.

Tuesday, 16th September, 1913

9.30 a.m.—Business Session at the Public Library.

(l) Adoption of amendments to the By-laws, Code of Ethics, Regulations for Architectural Competitions and Schedule of Charges.

11.00 a.m.—Automobile ride in and around the city, ending at "Bowness" for lunch, lent by Mr. John Hoxtall, for lunch given by the Calgary Chapter of the Alberta Association of Architects.

2.00 p.m.—(m) Adjourned matters.

(n) Lecture on Ferro Concrete by Mr. F. Goldie Engholm, A.M.I.C.E., A.M.I.M.E., of Vancouver, B.C.

(o) Place of meeting of the next General Assembly to be chosen.

3.00 p.m.—Meeting of the new Council for the election of officers and to consider other matters.

4.00 p.m.—Entertainments and visits.

8.00 p.m.—Smoker offered by the Calgary Builders' Exchange.

Committee of Arrangements.—Messrs. J. H. G. Russell, F.R.A.I.C., President; Roland W. Lines, F.R.A.I.C.; L. M. Gotch, M.R.A.I.C.; G. M. Lang, F.R.A.I.C.; W. D. Cromarty, M.R.A.I.C.; Alcide Chausse, F.R.A.I.C.

Arrangements have been made between the Montreal Board of Control and Mr. Norman McLeod by which the latter will complete the construction of the civic filtration plant at Point St. Charles. Mr. McLeod, who holds the contract, alleged sometime ago that the design was faulty and the site unsuitable, but a commission of engineers reported against these contentions. The Board of Control have agreed to extend the time for completion by 15 months and to remit the fine of $100 per day which was to have commenced on 1st September, the penalty date being postponed to December, 1914. Mr. J. W. McConnell, a well-known financier, has guaranteed the completion of the work. Last winter the work was severely damaged by frost, and this has been repaired by the contractor.

Canadian Railroad Development

Actual work on the Port Dover, Dunnville, Wellandport and Beamsville Electric Railway, which has been hanging fire for several years, will be started next week.

On the old Government House property at Toronto, the C. P. R. will erect their new freight offices, the plans for which are not yet to hand. On the Simcoe street frontage a seven-storey brick office will be built. At least a million dollars will be expended on the scheme in its entirety.

The plans for the G. T. P. yards now under construction at Weyburn, Sask., have been made known, and point to extensive operations by the company in Weyburn. The yards extend one mile in length and will contain about seven and a half miles of tracks. A standard freight shed, loading platform and depot will be erected.

The Canadian Northern Pacific Railway has been completed 114 miles from Port Mann and tracklaying has commenced northward from Anderson Creek. Bridge building will, however, delay further tracklaying for a few weeks and it is expected that the road between Port Mann and Kamloops will not be completed before the end of the year.

The Canadian Northern Railway officials have received definite information from the contractors that the line between Sudbury and Port Arthur, a distance of 450 miles, will be completed and ready for operation by Christmas. The recent enlargement of the C. N. R. elevators at Port Arthur, bringing their capacity up to the ten million bushel mark, was undertaken in order that the elevators might be ready when the steel was laid. With the same end in view, large orders for rolling stock have been given.

Sir Thomas Shaughnessy has under consideration at the present time the details of the 16-storey office building which the C. P. R. intends to erect at the corner of Portage and Main, Winnipeg, on the site of the present Canada Life Building and, the adjoining property to the south. It has been arranged that the work of demolition of the present buildings will be begun in 1914 and about two years will be spent in the erection of this new edifice, which will be very similar to the Toronto building recently completed.

The Canadian Northern Railway Company has announced that it expects to be operating trains over its line from the Canadian Northwest to Quebec this fall. All connections between Quebec and Ruel, Ont., 849 miles, will be ready for train service shortly, and the road from Sudbury to Port Arthur opened for traffic a month later, which will give the Canadian Northern Railroad direct communication from Quebec to the end of its present line in the northwest.

The plans for the Transcontinental Railway workshops to be built at St. Malo with copies of detailed specifications, are now at Quebec. The plans in question cover the sewerage and water service, some 15 miles of yard storage railway tracking in connection with the projected locomotive and car shop plant, in detail as follows: locomotive, boiler and tank house, forge shop, store house, oil house, power house, chimney, reservoir, forge stores and scrap bins, indirect heating apparatus, direct heating system, sewer system, water piping system, midway crane runway, office building, freight car shop, planing mill, dry kiln and lumber yard, the whole to cost in the vicinity of $1,500,000.

Personal Mention

Messrs. Campbell & Latimer, railway contractors, have removed their offices from Petrolia to 305 Bell Telephone Building, Toronto.

Mr. Samuel Hill was elected president of the Pacific Highway Association at the 4th annual convention of that body held recently at Vancouver.

Mr. F. L. Fellowes, City Engineer of Vancouver, is reported to have been asked to terminate his agreement with the city at the end of six months as a result of a loss sustained through defective water pipes approved by his representative. Mr. Fellowes went to Vancouver three years ago from Westmount at a salary of $8,000 a year. It is of interest to record that this is the highest figure paid any city engineer in Canada.

Canadian City Engineers

Mr. W. P. Near, St. Catharines, Ont.

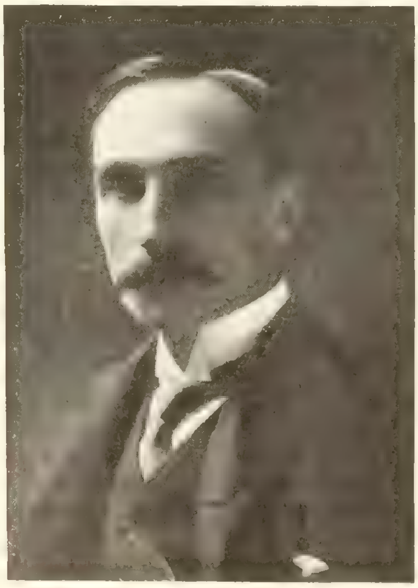
Mr. W. P. Near, B.A., B.A.Sc., City Engineer of St. Catharines, Ont., was born at St. Mary's Ont., where he received his early education, entering the University of Toronto in 1898. He graduated in mathematics and physics in the spring of 1903, and the following year was engaged as Assistant Lecturer in Physics.

He entered the School of Practical Science in the second year with the class of 1906, and on graduating succeeded in taking the first General Proficiency Prize in Civil Engineering. In 1907 he obtained the degree of B.A.Sc. with honors.

During the summer of 1905, he was engaged at the Dominion Observatory at Ottawa and was a member of the First Canadian Eclipse Expedition to Labrador to witness the total eclipse of the sun visible there in August, 1905. Mr. Near spent the summer of 1906 on the survey staff of the International Boundaries Surveys, working through the mountains in Southern British Columbia on the 49th parallel of latitude.

After leaving college in 1907 he served one year on the T. & N. O. Rly. surveys as transitman, being engaged on the preliminary survey of the Cobalt-to-Sudbury line and later, during the fall and winter, on the revision of grade and line of the main line between North Bay and Jocko. In May, 1908, he again joined a Boundary Survey party as assistant and journeyed to Alaska and the Yukon to locate the 60th parallel of latitude between British Columbia and the Yukon. Here he spent a strenuous season in mountain-climbing and precise surveying. On his return from Alaska, having completed a journey of 21,000 miles, he decided to settle in Toronto, where he accepted a position as Resident Engineer in the Main Drainage Department under Mr. C. H. Rust, then City Engineer. Later he was given charge of the construction of the whole Trunk Sewers Department, a position which he filled for nearly two years.

Mr. Near is an Associate Member of the Canadian Society of Civil Engineers of four years' standing. He is also an Associate Member of the Royal Astronomical Society of Canada.



Mr. F.L. Fellows, City Engineer of Vancouver, who is retiring.

Mainly Constructional

The News in Brief—From Coast to Coast

The first modern apartment house to be erected there is now under construction at Fort William.

The corner stone of the new Technical School at Toronto was laid by Premier Borden on August 26th.

The work of putting in the foundation for the new city incinerator plant at Fort William has started and will be completed this fall.

The city of Calgary has awarded a contract to the General Supplies Company of that city for valves and steam pipes amounting to $26,000.

It has been stated that construction work will be commenced this autumn on the plant of the Electric Steel and Metals Company, which is to be built here.

The Turbine Equipment Company, Limited, has been incorporated with a capital of $40,000, to carry on business as civil, mechanical and electrical engineers, contractors, etc., with head office at Toronto.

The Toronto Housing Company have plans at the city architect's office for 59 houses on Bain and Sparkhall avenues, Toronto. These are to be two-storey brick buildings, and will mean an expenditure of $120,000.

A permit for the erection of a new grand stand at the Woodbine race track, Toronto, was issued recently. Having a spacious and substantial basement, the stand will be in reality a double-decker, constructed of brick and steel. The cost is estimated at $100,000.

The elevator to be built at Calgary will cost in the neighborhood to begin with of $1,500,000, and will have an initial capacity of three million bushels of grain. It will be built in such a way as to provide for the addition of further units, which will ultimately give it the capacity of twenty million bushels.

The tender of the R. J. Lecky Company for the construction of the new wing of the Regina General Hospital, has been accepted by the Hospital Board. The contract price is $88,107. The contract for the erection of the isolation hospital has been let to Minkley and Traub, their tender for the work being $77,600.

Consulting engineers F. P. Stearns, Rudolph Hering and James A. Fuertes have submitted their report upon the proposal to use Shoal Lake as the source of water supply for the Greater Winnipeg water district. The report is favorable to the project and recommends that the work be undertaken with as little delay as possible.

Building operations in Halifax this year will be greater than those of last year, and value of construction work begun in 1913 promises to double that of 1912. The building permits for July, 1913, amounted to $201,400 as against $143,100 for July, 1912. The total for 1913 up to the end of July was $506,700 as against $352,025 for the same period in 1912.

For some time the Controllers of Montreal have had under consideration the installation of a more economical garbage plant, the present system costing a large annual outlay for haulage. The Controllers have now commissioned Mr. R. S. Lea, of Montreal, a well known authority on the subect, to prepare a report on the subject, making provision for the disposal of 700 tons per day.

Owing to the general financial condition which has rendered it difficult for many municipalities to get the necessary money to continue their municipal work, the city of Prince Albert will temporarily suspend construction work on their hydro-electric development at LaColle Falls. The dam is already nearing completion and is understood to be in such shape that the delay will not cause any deterioration of the structural work.

Tenders for the extensive harbor improvements at Toronto have been received at Ottawa along with those for the Severn River section of the Trent Canal, and for section three of the Welland canal. These great undertakings will involve the expenditure of many million dollars. The different tenders are being extended, and contracts will be awarded shortly. It is understood that for the Toronto harbor works there are six proposals.

The Standard Clay Products, Limited, St. Johns, P.Q., are doubling their plant at New Glasgow, N.S., so as to bring its capacity up to that of their main plant at St. Johns. The kilns are to be increased from 9 to 19, and this will mean the employment of a total of 250 hands. It is hoped to have the enlarged plant in operation by 1st October, giving an output, according to Mr. C. S. Trotter, the manager, of 3,000 cars per annum of piping, flue lining, building blocks and junctions.

The Canada Iron Corporation is to be re-organized, Mr. F. F. Whyte, of New York, being appointed receiver pending a reconstruction of the finances. The company has been affected by the cessation of the bounties on pig iron and keen competition from other countries, the directors stating that their products are not sufficiently protected by duties. The last annual statement showed sufficient profits to meet fixed charges with a balance of $46,566. The corporation has mines at Eganville, Ont., Bessemer, Ont., Bathurst, N.B., and Torbrook, N.S.; furnaces at Midland, Ont., Radnor Forges, P.Q., and Drummondville, P.Q.; and foundries at Fort William, Hamilton, St. Thomas, Midland, Ont., Montreal, Three Rivers, P.Q., and Londonderry, N.S.

Mr. G. M. Gest has been awarded the contracts for two additional sections of the underground conduit system planned by an electrical commission for laying wires underground. Mr. Gest, who is now carrying out the first section, was the lowest tenderer for both new sections. For the section from Guy street to Atwater Avenue, on St. Catherine street, the bids were: G. M. Gest, $45,969, time required two working months; L. A. Ott, $52,449, 90 working days; C. E. Deakin, $46,025; Dietrich, Limited, $62,226, three working months; Quinlan and Robertson, $50,961; Standard Construction Company, $52,199, four working months. For the Bleury street section: G. M. Gest, $128,418, time required four working months; L. A. Ott, $160,898, 125 days; Standard Construction Company, $156,338, 6 working months.

An electrical fire alarm system is being installed at Valleyfield, P.Q., by Sevigny & Lalonde, Notre Dame Street West, Montreal. The equipment consists of Gamewell non-interfering Excelsior fire alarm boxes connected in series, supplied by the Northern Electric and Manufacturing Company. The town is divided into four districts, five boxes being installed in each division, these being connected to the central fire station and also to the waterworks. The system is worked by means of two closed metallic circuits, north and south, which can be used together, or separately in case of necessity. The electro-motive force for operating the system is furnished by gravity batteries, of sufficient power to give 1-10 ampere for each circuit. Lightning arresters are provided in each station, while a switchboard is installed in the central station.

Trade Notes

The exhibit of the Ceresit Waterproofing Company at the recent International Cities and Town Planning Exhibition, Ghent, Belgium, achieved the distinction of being awarded the Grand Prix.

The Squires improved steel trap, for which Messrs. Canadian Allis-Chalmers, Limited, Toronto, are the selling agents, is described in an interesting bulletin. This trap is distinguished by ready access to the few working parts, low cost of maintenance, great capacity, durability and high efficiency.

A catalogue received from the Bradford Pressed Brick Company, Bradford, Pa., is interesting as showing the wide range of possibilities of red pressed brick. The Bradford Company manufacture only the one color and they claim that their product "is probably the most beautiful red brick in America." The catalogue contains colored illustrations of many of their lines.

Catalogue K, of the Brown Hoisting Machinery Company, Cleveland, Ohio, contains a general description of Brownhoist locomotive cranes of various capacities and shows by illustrations how the cranes are used in connection with the Brownhoist patented grab buckets. The illustrations are illuminating as to the efficiency of this equipment under exacting conditions.

A copy of "No-Rim-Cut News," the official organ of the Goodyear Tire & Rubber Company of Canada, has reached us. The paper is made exceedingly attractive by a number of cuts and upon the front page is to be found a view of what is to be the new home of the company in Toronto. It contains considerable information concerning the Goodyear company and their methods of operation. An article on their monthly credit memos is very interesting while the description of their laboratory tests of all raw materials, and the second instalment of the method of making an automobile tire are full of information. "No-Rim-Cut News" should prove interesting reading to the many users of rubber tires.

A new kind of flooring is being tried out in one of the new cars just put into service by the Ottawa Electric Railway Company. It is called "mastic flooring," and is a preparation something like asphalt, but can resist over 400 degrees of heat before melting. It is put on over the ordinary wood floor in practically the same was as asphalt is put on the streets. The makers, the Canada Floors Limited, of Montreal, claim that their new product has several advantages over ordinary wood floors, namely that it is easier to clean, is more sanitary, better in appearance and almost everlasting. If it proves satisfactory it is likely all the cars owned by the Ottawa Electric Railway will be equipped with it.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Waterworks, Sewerage and Roadways

Brockville, Ont.

Rocmac pavement from Park street to east Town limits, planned by Town Council. Mayor, John MacKenzie. Clerk, Geo. Dewey. Plans and specifications at office of Engineer, Geo. Bryson.

Calgary, Alta.

Filtration plant and pumping station for City Council. Waterworks Engineer, A. W. Ellson Fawkes. Contemplated constructing above with a capacity of 40,000,000 gals. daily.

Goderich, Ont.

Tenders received by Clerk, L. L. Knox until September 11th, for approximately 14,500 sq. ft. cement concrete walks on Nelson, Park and Wellesley streets and Britannia road. Engineer-in-charge, J. Ades Fowler, C.E.

Kingston, Ont.

Tenders received until Sept. 5th for construction of approximately 4,250 sq. yds. asphalt block pavement, 1,330 lin. ft. concrete curb and gutter, 1,040 lin. ft. concrete gutter and 2,000 sq. ft. concrete walk (widening walk). Plans, etc., at office of City Engineer. Mayor, T. J. Rigney. City Engineer, R. J. McClelland.

Montreal, Que.

Macadamized roadway, St. Catherine Rd., planned by Town Council of Outremont. Sec.-treas., Mr. Sampson. Granite macadam covered with Tarvia.

Water pipes, cost $14,000, for Longue Pointe Ward. Sec., L. N. Senecal. City Council to be asked for appropriation for replacing small old pipe by new 8 in. pipes.

Levelling and paving, cost $27,000, St. Denis, planning by Board of Commissioners. Sec., L. N. Senecal.

Stamford Twp., Ont.

Waterworks, cost $10,000, contemplated by the Municipal Council. Clerk, C. F. Munroe, Southend. By-law will be submitted to ratepayers.

Toronto, Ont.

Roadways, etc., planned by Board of Control. Mayor, H. C. Hocken. Commissioner of Works, R. C. Harris. Bathurst street, south of bridge, cedar block, $2,833; Gerrard-Leslie to Greenwood, asphalt, $4,686; Huntley street, rocmac, $2,451; Wheeler ave., grading, $8,313; Avondale-Park to Rosedale, rocmac, $2,971; Terauley-Queen to Agnes, asphalt, $11,839.

CONTRACTS AWARDED

Estevan, Sask.

Outfall sewer and sewage disposal works, cost $29,500, for Town Council. Sec.-treas., P. J. Stephens. Engineers, Chipman & Power, Mail Bldg., Toronto. General contractor, H. E. McKenzie. For outfall sewer from trunk sewer, sewage disposal beds, septic tanks and spray filters.

Grey Twp., Ont.

Drains for Twp. Council. Clerk, Alex. H. McDonald, Ethel, Ont. Contract for Pollard Drain, awarded to Henry Alcock, c/o Clerk, at $2,319; Silver Corners Drain, awarded to Daniel Reed, c/o Clerk, at $1,285; Inglis Drain, John Matthews, c/o Clerk, at $2,266.

Montreal, Que.

Paving, cost $330,067.60, planned by Board of Commissioners. Secretary, L. N. Senecal. Contracts awarded as follows: Pavements on four streets, $165,521.49, Bitulithic Paving Co., 745 St. Catherine W.; four streets, $89,087.20, Warner, Quinlan Asphalt Co., Guy Blk.; seven streets, $75,458.91, Sicily Asphaltum Paving Co., Ltd., 45 Prince street.

Port Arthur, Ont.

Pump house, cost $12,995. Commissioner of Utilities, J. J. Hackney. General contractors, Thunder Bay Contracting Co.

St. Frs. De Sales, Que.

Macadamizing 10 miles of roadway. Sec.-treas., Anatole Gascon. General contractors, M. J. Stack & Co., 167 McCord St., Montreal.

St. Vincent De Paul, Que.

Macadamizing roads planned by Town Council. General contractors, M. J. Stack & Co., 167 McCord St., Montreal.

Sault Aux Recollet, Que.

Macadamizing roads planned by Town Council. Sec.-treas., J. A. Cadieux. General contractors, M. J. Stack & Co., 167 McCord St., Montreal.

Winnipeg, Man.

Concrete mixer, cost $2,625, required by Board of Control. Secretary, M. Peterson. Engineer, H. N. Ruttan, 223 James ave. General contractors, Dom. Equipment & Supply Co., 46 Canada Life Bldg.

Concrete pavements planned by Board of Control. Secretary, M. Peterson. Engineer, H. N. Ruttan, 223 James ave. General contractors, Fielding & Shepley, 305 Travellers Bldg., and J. W. Astley, engineer of construction.

Sewers and water mains. Engineer, H. N. Ruttan, 223 James ave. General contractor, J. W. Astley, engineer of construction. Board of Control, Secretary, M. Peterson.

Railroads, Bridges and Wharves

Chatham Twp., Ont.

Construction of new Wade Drain and repairs to Stephen, Henson, Pollock and 4th Concession Drains, planned by the Twp. Council. Clerk, A. McArthur, Tupperville.

Grafton, Ont.

Bridges owned by Haldimand Twp. Council destroyed by fire. Clerk, Reuben Lawless, Grafton, Ont.

Meaford, Ont.

Revetment wall ,extension and repairs, planned by Dom. Govt., Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Tenders received by Secretary until 4 p.m. Sept. 29th. Plans, etc., at office of J. G. Sing, Dist. Engineer, Confed. Life Bldg., Toronto; J. H. Armstrong, Dist. Engineer, Midland; Postmaster, Meaford, and at Dept., Ottawa.

Montreal, Que.

Concrete wharf, 500 ft. long, planned by Harbour Commissioners of Montreal, 57 Common street. Secretary, David Sneath. Engineer in charge, F. W. Cowie, 57 Common street, Montreal.

Port Arthur, Ont.

Breakwater, cost $500,000, for Dominion Govt., Dept. of Public Works, Sec., R. C. Desrochers, Ottawa. Engineer-in-charge, F. I. Harcourt. Tenders to be called this Fall. Second extension of breakwater, crib work on piles, concrete superstructure.

Province of Que.

Bridge, cost $2,550, over Morissette Brook, planned by Municipal Council of St. David. Sec.-treas., L. W. Joyal. Plans, etc., at office of Sec.-Treas. One span, 20 x 16, concrete, 5-15 in. I-beams, 42 lbs., 24 ft. long, steel and 4 in. red pine.

Bridge, cost $2,450, planned for Municipal Council of St. Hilaine. Plans, etc., at office of Sec.-Treas., Y. E. N. Desrochers. One span, 20 x 20, concrete, steel, 6-I-beams, 42 lbs., 24 ft. long, reinforced concrete.

C. P. Rly. Co. has been authorized to construct bridge No. 113.1 on its Sherbrooke sub-division Eastern Division, Que.

Rainy River, Ont.

Sheet piling, cost $11,000, 80 feet, planned by Dom. Govt., Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Engineer-in-charge, E. Y. Harcourt, Port Arthur. Tenders to be called for shortly.

St. Malo, Que.

Car shop repair plant, cost $1,500,000, for Commrs. Transcontinental Rly. Sec., P. E. Ryan, Ottawa. Tenders called. Time extended from Sept. 2nd to Sept. 9th. Received by Sec. Plans, etc., at office of G. Grant, Chief Engineer, Ottawa; A. E. Doucet, Dist. Engineer, Quebec City. Deposit required, $50,000.

Sussex, N.B.
Station for Intercolonial Railway Co. Tenders received by Chief Engineer, Mr. MacKenzie, Moncton, until Sept. 3rd. Brick and stone construction.

Twp. of Toronto, Ont.
Railway extension planned by Toronto Suburban Rly Co., 936 Keele St., Toronto. Manager, Geo. C. Royce, c/o Company. Draft of agreement prepared for extension of railway to Erindale.

Victoria Harbor, Ont.
Wharf planned by Dom. Govt., Dept. of Public Works. Tenders received by Sec., R. C. Desrochers, Ottawa, until Sept., 8th. Plans, specifications, at Dept., Ottawa.

Westboro, Ont.
Bridge for Twp. of Nepean. Reeve, Mr. Honeywell. Engineer not decided. Recontruction of bridge (McFarlanes), concrete construction.

CONTRACTS AWARDED

Provinces of Alberta and Saskatchewan
Stations for Canadian Northern Rly., Winnipeg. Architect, R. B. Pratt, Co.'s Architect, Winnipeg. General contractors, C. N. R., B. & B. Dept. Will build all stations on the Vegreville-Calgary and Saskatoon-Calgary lines by day labor.

Fort William, Ont.
Electric shop, cost $15,000, McIntyre street, for C. P. Ry. General contractor, J. H. Simmons, Winnipeg, Man. One storey, 32 x 80.

Hope, B.C.
Railway, cost $3,000,000, from summit of Hope range along the Coquahalla River to the town of Hope, a distance of 38 miles, planned by the Kettle Valley Ry. Co. President and general manager, J. J. Warren, Penticton, B.C. General contractors, McArthur Bros. & Co., New York, N.Y.

Island River, N.B.
Dredging planned by Dom. Govt., Department of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractors, W. J. Poupore Co., Ltd., 211 McGill street, Montreal.

Little Current, Ont.
Dredging planned by Dom. Govt., Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractors, Soo Dredging & Constr. Co., Ltd., Sault Ste. Marie.

Montreal, Que.
Underground conduits for Board of Commissioners. Sec., L. N. Senecal. General contractor, G. M. Gest, 83 Graig St., for work on Bleury St. and Park Ave., $128,418.85, and for work on St. Catherine St., $45,969.15.

Port Arthur, Ont.
Breakwater, cost $1,522,000, Unit No. 1, for Dom. Govt., Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Engineer-in-charge, E. Y. Harcourt, Port Arthur. General contractors, Thunder Bay Contracting Co., Port Arthur. Superstructure well under way, to be completed this year.

Dredging, cost $122,000, Main Harbour, for Dom. Govt., Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Engineer-in-charge, F. Y. Harcourt. General contractor, W. E. Phin, Dredging Contractor.

Rainy River, Ont.
Pile wharf, cost $5,000, for Dom. Govt., Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Engineer-in-charge, F. Y. Harcourt. Work done by day labor. Tamarac, spruce and pine construction.

Rustico, P.E.I.
Dredging planned by Dom. Govt., Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractor, V. T. Bartram, 123 Bay St., Toronto.

Vancouver, B.C.
Docks, cost $1,250,000, for Dom. Govt., Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractors, Henry, McFee & McDonald.

Walton, N.S.
Extension to wharf planned by Dom. Govt., Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractor, Albert Parsons, Walton.

Public Buildings, Churches, Schools, etc.

Beachville, Ont.
Heating and ventilating for school. Tenders received by Architect, B. McNichol, Mary St., Woodstock, Ont., until noon Sept. 4th. Plans, etc., at his office. Four rooms.

Comox, B.C.
School planned by Prov. Govt., Dept. of Public Works, Victoria. Minister, Hon. Thos. Taylor. Engineer, J. E. Griffiths. Plans, specifications, etc., at offices of J. Carthew, Sec. of School Board, Comox; J. Baird, Govt. Agent, Cumberland, or the Dept., Victoria. Tenders received by Minister till Sept. 8th, for erection and completion of a 2-room school and conveniences.

Drinkwater, Sask.
School, cost $10,000, for School District No. 969. Treas., Jas. W. A. McIsaac. Two-room brick veneered. Plans in progress.

Halifax, N.S.
Tenders received until Sept. 15th for construction of wooden lighthouse and dwelling combined, also oil shed at Burntcoat, Hants County. Plans and specifications, etc., at Dept. of Marine and Fisheries, Ottawa and Halifax, and post offices at Burntcoat, Windsor, Truro and Maitland.

Jaffray, B.C.
Tenders received by Minister, Hon. Thos. Taylor, till Sept. 9th, for erection of a large 1 room school houe. Engineer, J. E. Griffiths. Plans, specifications, etc., at office of J. S. T. Alexander, Govt. Agent, Fernie; E. S. Home, Sec. School Board, Jaffray, and the Dept., Victoria. Prov. Govt., Dept. of Public Works, Victoria.

Main Duck Island, Ont.
Tenders received by Sec., Alex. Johnston, Ottawa, Dom. Govt., Dept. of Marine & Fisheries, until noon Sept. 16, for the construction of a reinforced concrete tower, wooden residence, boathouse and oil store. Plans, specifications, etc., at Dept., Ottawa, and Post Offices at Kingston, Picton, Bath, Deseronto, Trenton and Gananoque.

Montreal, Que.
Alterations to City Hall, Notre Dame street, planned by Board of Commissioners. Secretary, L. N. Senecal. Architects, Marchand & Haskell, 164 St. James street, Montreal. Tenders will be called by architects in about three weeks.

Preliminary plans are being prepared for the erection of a convent. Architect, L. A. Content, 17 Place d'Armes Hill.

Club house for Pte. Claire Boating Club, Pointe Claire. Architect, Mr. Henderson, c/o Wadsworth & Henderson, New Birks Bldg, is preparing plans.

Preeceville, Sask.
School, cost $2,500, contemplated by School District No 2850. Treas., James Fraser. Plans will be prepared.

Robson, B.C.
School, Ymir District. Prov. Govt., Dept. of Public Works, Victoria. Minister, Hon. Thos. Taylor. Engineer, J. E. Griffith. Plans, specifications, etc., at offices of W. F. Teetzel, Govt. Agent, Nelson; H. R. Townsend, Govt. Agent, Rossland; N. Y. Wickham, Sec. School Board, Robson, or Dept. of Works, Victoria. Tenders received by Minister till noon Sept. 9th, 1913, for erection and completion of a large 10-roomed school.

St. John, N.B.
Tenders addressed to A. Johnston, Deputy Minister of Marine & Fisheries, Ottawa, will be received until Sept. 12th, for the construction of a wooden lighthouse tower at Grande Anse, Gloucester County. Plans, specifications, etc., at the Dept., Ottawa and St. John, and Post Offices at Caraquet, Grande Anse, Shippegan and Bathurst.

Salmo, B.C.
Tenders received by Minister till noon Sept. 10th, 1913, for construction of a lock-up and constable quarters. Prov. Govt., Dept. of Public Works, Victoria. Minister, Hon. Thos. Taylor. Engineer, J. E. Griffith. Plans, specifications, etc., at offices of W. F. Teetzel, Govt. Agent, Nelson, B.C., the Prov. Constable, Salmo, and the Dept. of Works, Victoria.

Toronto, Ont.
Home planned for I. O. F., Temple Bldg. Supreme Chief Ranger, E. G. Stevenson, will build and maintain home for aged members of order. Location not yet decided.

Three Rivers, Que.
Mausoleum for the Quebec Mausoleum Co., Ltd., 136 St. James St., Montreal. Builders and architects, Owners. Three storeys, 50 x 50, concrete construction throughout. Plans being prepared.

Vancouver, B.C.
P. O. Station "B", interior fittings, for Dom. Govt., Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Plans with W. Henderson, Res. Architect, Victoria, at P. O. Vancouver, and Sec., Public Works Dept., Ottawa. Tenders received by Sec., until Sept. 19th.

Viceroy, Sask.
School, cost $5,000, contemplated for School District No. 3007. Treas., Andrew Moffett.

Victoria, B.C.
Public building planned . Tenders will be called shortly by Dom. Govt., Dept. of Public Works, secretary, R. C. Desrochers, Ottawa.

Hospital building planned for Royal Provincial Jubilee Hospital. Architect, Loring P. Rixford, Humboldt & Gordon. Plans were chosen in competition.

West Toronto, Ont.
Lodge hall for Lakeview Lodge No. 272, I. O. O. F. Sec., H. P. Scorer, c/o Campbell's Hall. Site purchased Keele St., north of Annette St. Plans under way.

Winnipeg, Man.
School, Deer Lodge (Linfield St.), for Rural Municipality of Assiniboia. Sec., F. Ness, Kirkfield Park P. O. Architect, A. Melville, 405 Builders' Exchange. New by-law will be submitted to ratepayers on Sept. 13th, 1913.

Fountain, cost $10,000, Central Park, planned by Parks Board, 229 Chambers of Commerce. Sec., J. H. Blackwood. Work will not start till next year. Design not yet selected.

CONTRACTS AWARDED

Berlin, Ont.
Theatre and office building, King W., for H. L. Janzen. Architect, C. Knechtel. General contractor, C. Braun, King street.

Municipal barns planned by City Council. Architect, C. Knechtel. Mason, H. Dunker, Charon street. Foundations in.

Fire hall, cost $18,000, Edward street, planned by Town Council (Fire & Light Com.). Architect, C. Knechtel. Carpenter, Geo. Butcher, Scott St. Plumbing, Hollinger & Durst, Frederick St. Glen William stone and red brick construction.

Cobalt, Ont.
Contract for erection of municipal buildings here has been awarded to Hill-Clark-Francis Ltd., general contractors, of New Liskeard. Concrete foundation, brick superstructure, reinforced with steel.

Elmira, Ont.
Post office, cost $35,000, for Dom. Govt., Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractor, E. A. Bleakney, Gananoque, Ont. Concrete work, J. E. Bowman. Brick work, C. Scheutz.

Halifax, N.S.
Extension to college, cost $45,000, for Roman Catholic Corporation. Archbishop of Halifax, Rev. Dr. McCarthy, Dresden Row. Architect, H. E. Gates, Dennis Bldg., Granville St. General contractors, S. A. Marshall & Son, Keith Bldg., Barrington St. Three storeys and basement., 90 x 40, pressed brick and granite construction.

Moncton, N.B.
Church, cost $52,000, Queen St., for First Baptist Church Congregation. Sec. of Trustees, W. H. Estano. Architect, C. B. Chappell, Charlottetown, P.E.I. General contractor, J. M. Clark, Summerside, P.E.I. 150 x 100, to be brick with stone trimmings.

Montreal, Que.
Grenadier guard armoury, Esplanade, for Dom. Govt., Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Architects, MacVicar & Heriot, 104 Union Ave. General contractor, mason, carpenter, plastering, painting, D. G. Loomis, St. Patrick. Roofing, Campbell Gilday & Co., 663 St. Paul St. Heating and plumbing, Hickey & Aubut, 93 Dominion St. Electric, Montreal Elec. Co., 425 St. James. Marble and tile, Robt. Ball & Co., 174 Mountain St.

Academy "Proulx," cost $150,000, Parthenais, for Commrs. Scolaire St. Gregeire de la Thaumaturge, c/o E. Pinonneault, 880 Mt. Royal. Architect, Chas. Bernier, 70 St. James St. General contractor, A. Pion, 338 Marquette. Marble and tile, Lepage Marble Works, 734 St. Lawrence Blvd. Ornamental iron, F. Gillet, 225a Craig E. Four storeys, 139 x 139, concrete foundation, brick, terra cotta and steel construction.

New Westminster, B.C.
Public building planned by Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Architect, W. Henderson, Res. Architect, Victoria. General contractors, Sloan & Harrison.

Ottawa, Ont.
Stone and iron fence for Rideau Hall planned by Dom. Govt., Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractor, A. G. Marshall, 5 O'Connor St.

Regina, Sask.
College, cost $35,000, 6th ave., for Diocese of St. Chads. Architects, Storey & Van Egmond, 1 Credit Foncier Bldg. General contractors, R. J. Leds Co., Ltd., Northern Crown Bank Bldg. Painting, Harris & Co., Albert street. Heating & Plumbing, Potts & Smith, 1841 Cornwall. Electrical work, Sun Electric Company, Scarth street.

Toronto, Ont.
R. H. Harman & Son, 156 Dupont, have been awarded the masonry contract for the Webb & Hutchison theatre on Queen street east, Toronto.

Sunday school, cost $55,000, Lowther, for Walmer Rd. Baptist Church. Chairman of Com., R. C. Dancy, 171 Spadina Rd. Architects, Burke, Horwood & White, 28 Toronto St. Carpenter, Jas. McKenzie, 359 Yonge St. Roofing, Rennie & Son, 130 Dupont St. Painting, F. G. Roberts & Co., 104 Wells St.

Theatre, cost $15,000, Elm and Yonge, for Jacob Vise, 290 Yonge St. Architect, Neil G. Begg, Cosgrave Bldg. General contractors, Orr Bros., Queen E. Plastering, Wm. Webster & Son, 183 Major street.

Lodge Hall, 805 Dovercourt, for Sovereign Hall Co., c/o Architect. Architect, W. G. Hunt, 935 Bloor W. Three storeys, 40 x 85, brick construction, stone foundation corrugated iron, felt and gravel roofing. Day labor, under Architect's supervision. Temporary roof to be put on basement. Hall will be used by I. O. O. F. this fall. Foundations in.

Vancouver, B.C.
Theatre, 647 Commercial Ave., for R. J. McLean, 1220 13th Ave. E. Architect, J. Y. McCarter. General contractors, Dominion Constr. Co., Ltd., 509 Richards. Two storeys, reinforced concrete construction.

Winnipeg, Man.
School, Clifton street. Secretary-treas., R. H. Smith. Architect, J. B. Mitchell, William and Ellen. General contractors, Sutherland Construction Co., Carlton Bldg. Heating, Green & Lister, Fort street. Plumbing, C. C. Young, 789 Sherbrooke street. Electrical work, Northern Electric Co., Ltd., Henry ave.

Business Buildings and Industial Plants

Bradford, Ont.
Factory for Watson-Smith Co., Ltd., 161 Geary Ave., Toronto. Woodworking, wire screens, etc. Ratepayers granted bonus of $20,000. Building to be erected this fall, 50,000 sq. ft.

Cumberland, B.C.
Bank building for The Royal Bank of Canada. Two storeys, 25 x 40, vaults and safes, apartments for staff. Plans ready.

Drummondville, Que.
Coal handling plant planned for Intercolonial Railway Co. Forms of tender at office of Chief Engineer, Mr. MacKenzie, Moncton, at either of the above places, who will receive tenders for mechanical coal handling plant.

Montreal, Que.
Shoe factory, 543 Desjardins, owned by Rideau Shoe Co., c/o J. A. Adam, 529 Lafontaine, destroyed by fire. Loss, $45,000.

Bank building, Sandwich street east, for Merchants Bank, Montreal, Que. Architects, Hogle & Davis, 80 St. Francois Xavier street, Montreal. Two storeys, cement and brick foundation, pressed brick construction. The plans for this building are to be forwarded from Montreal and tenders called here.

Offices contemplated for Liverpool, London & Globe Insurance Co., 112 St. James street. Manager, Mr. J. Gardner Thompson. Plans will be prepared.

Regina, Sask.
Office, 11th and Corwall St., for National Trust Co., Ltd., 404 Darke Bldg. Architects, Pratt & Ross, Elec. Rly. Chambers, Winnipeg. This project has been called off this year owing to alterations that will be made to plans. Work will go on in spring 1914.

Hotel, cost $40,000, planned by R. A. Cannan, 403 Darke Block. Architects, Brown & Vallance, Canada Life Bldg., Montreal. Five storeys.

Extension to jewellery store, cost $7,500, for F. G. England, 1776 Hamilton St. Extension 50 ft. long, brick construction, concrete foundation, electric lighting, steam heating. Plans in progress.

Saskatoon, Sask.
Business block, cost $250,000, 1st Ave. and 23rd St., for N. Gardner, Boggs and Sir Jno. Lungham. Five storeys. Plans ready.

Swift Current, Sask.
Warehouse planned for Moose Grocery. Work will be started this fall.

Windsor, Ont.
Addition to paint factory, cost $2,500. for Standard Paint & Varnish Company. Manager, Mr. Straith. Architects, Speir & Rhone, Detroit, Mich. Three storey addition. Plans ready.

Factory, for Burroughs Adding Machine Co., H. O. Detroit, Mich. Assembly plant to be established for Canadian trade. Plans in progress.

Welland, Ont.
Factory, cost $1,000,000, planned for Union Carbide Co. of Canada. Supt. of Co., John White, Niagara Falls, N. Y. Works manager, C. T. Ayers, New York, N.Y. Five buildings.

CONTRACTS AWARDED

Battleford, Sask.
Furniture factory, 1st Ave., for Convery & Sallows. Architects, Stephenson, Evans & Fillingham. General contractor, Geo. Quaadman. Brick work labor only, M. G. Lane. Heating and plumbing, B. N. Lewis. Three storeys.

Berlin, Ont.
Shoe factory, cost $26,000, Kaiser St., for Gourlay & Co., Kaiser St. General contractors, Secord & Sons, Brantford. Excavating, Mr. J. P. Wiber. Three storeys, 150 x 40. Excavating started.

Cochrane, Ont.
Bank building, 6th Ave., for Imperial Bank of Canada. Architect, W. E. Binning. Supt, of Construction, J. Peugh. Heating and plumbing, Louis Gies, King St., Dundas. Contracts for heating and plumbing for Manager's residence also awarded to above.

Fort William, Ont.
Grain drying plant, cost $8,000, Athabasca, for Guy Elevator Co., Graham and Horne Block. Architect and general contractor, S. J. McQueen. 55 ft. high, 12 x 25.

Hamilton, Ont.
Alterations to store, cost $4,000, for Duff Stores, Ltd., York St. Architects, Watt & Blackwell, Lister Chambers. General contractor, R. Somerville, 108 Sanford Ave. N.

Lacombe, Alta.
Bank building, cost $25,000, for Royal Bank. General contractors, Purdy & Henderson, 470 Granville St., Vancouver. Two storeys, 40 x 56, brick, cement foundation, tile and fireproof floors.

Lethbridge, Alta.
Dairy, cost $6,000, 5th Ave. E., for H. Hubbard. Architects and general contractors, Carpenter Bros. Plumbing, Dandson Metal Co. Electric. Chas. Cook. Two storeys, 75 x 75, brick, cement foundation. Excavation started.

Factory, cost $9,000, 3rd ave. and 12th St. N., for Mr. Marnico. Architect, E. E. Caner. General contractor, S. Bario. Roofing, plumbing and heating, Dandson Metal Co. Electric, Roy Electric Co. Painting, G. Emery. Two toreys, 100 x 50, brick construction. Foundations in.

Montreal, Que.
Alterations to tannery, cost $3,000, St. Ambroise, for Montreal Carriage Leather Co., 175 St. Ambroise. Architect, K. G. Rea, 54a Beaver Hall Hill. General contractors, Bonnell Bros., 341 Guy St. Carpentry, R. Ryan, 697 Atwater ave. Three storeys, 34 x 31, concrete foundation, felt and gravel roofing.

Two stores and four flats, cost $18,700, Notre Dame, for Louis Cohen, 516 Notre Dame W. Architect, L. J. T. Decarie, New Birks Bldg. General contractors and masonry, Purves & Henderson, 214 St. Antoine., will receive tenders for rest of work. 50 x 75, concrete footing, brick construction, store fronts and fixtures.

Addition to office building, cost $7,500, 58 St. Francois Xavier, for F. D. Monk, 58 St. Francois Xavier. General contractors, brick and masonry, Bonnell Bros., 341 Guy street. Carpentry, roofing, glazing, painting, electrical work, R. Ryan, rear 697 Atwater ave. Heating and plumbing, W. J. McGuire & Co., 332 Craig W. One storey addition, brick construction.

Warehouse, shops and offices, cost $40,000, Beaumont, for General Fire Extinguisher Co., 175 McCord. Architect, Robt. Findlay, 10 Phillips Place. General contractors, masons and carpenters, Reid, McGregor & Reid, Guy Block. Iron and steel, Structural Steel Co. General contractors will receive tenders for all other trades. Two storeys front for 60 ft, rest 1 storey, 220 x 120, cement foundation, brick construction.

Wholesale grocery and warehouse, cost $25,000, 1170 St. Lawrence, for P. Adelstein, 1173 St. Lawrence Blvd. General contractors, Gilbert Demers & Sarrazin, 861 St. Lawrence. Roofing, heating, plumbing and electric work, Rock Ouimet, 93 Vitre West. Painting, Donat Valquette, 888C St. Andre.

Factory, cost $75,000, St. Patrick St., for Canadian Tube & Iron Co., Ltd., Victoria St., Emard Ward. Architect, builder and general contractor, Owners. Steel, Structural Steel Co., New Birks Bldg. One storey, 417 x 300, concrete foundation, brick construction, felt and gravel and corrugated iron roofing .

Repairs to offices, cost $10,000, 317-21 Craig St., for Can. Metropolis Realty Co., Ltd., 120 St. James St., Montreal. General contractors, Anglins Ltd., 65 Victoria St.

Store, cost $12,000, St. Catherine St., for Mrs. H. E. Vautelet, 69 Victoria Ave. Architect, Chas. Bernier, 70 St. James St. General contractor, A. Pion, 338 Marquette. Roofing, heating, ventilating and plumbing, J. E. Hardy, 666 Papineau Ave. Plastering, Pascal Larocque, 341 de Lanaudiere. Painting not let yet.

New Liskeard, Ont.
Hill-Clark-Francis Ltd., general contractors, of New Liskeard, have been awarded the contract for a concrete store for J. F. Mulligan, also for erection of a Manse for the Presbyterian Church, concrete foundation, brick veneered.

Ottawa, Ont.
Warehouse, cost $63,000, York St., for S. J. Major & Co., York St. Architect, C. P. Meredith, 126 Sparks St. Heating, A Gauthier & Co., 307 Dalhousie. Plumbing, J. A. Langelier, 310 Wellington. Electrical, Marchand & Donnelly, 128 Sparks St.

Business block, cost $100,000, Bank, for F. W. Carling, Metropolitan Bldg. Architect, C. P. Meredith, 126 Sparks St. Ornamental iron, Canadian Allis-Chalmers-Bullock, Ltd., King and Simcoe, Toronto.

Business block, cost $100,000, for Mrs. Cowie, Albert St. Architect, C. P. Meredith, 126 Sparks St. Mason, T. C. James, 140 Flora St. Plastering, heating and plumbing, not let yet.

Preston, Ont.
Bank building for Merchants Bank of Canada, H. O. Montreal. Architects, Hogle & Davis, 80 St. Francois Xavier St., Montreal. General contractors, P. H. Secord & Sons, Brantford, Ont. Painting and interior decorations, Ed. Radigan, Galt, Ont.

Prince Albert, Sask.
Bank and offices for The Canadian Bank of Commerce, H. O. Toronto. Architects, The Dom. Realty Co., Ltd., King and Jordan Sts., Toronto. General contractors, Johnston & Coleman. Electric, Prince Albert Elec. Co., 108 8th St. Plumbing and heating, Manville Hardware Co. Concrete and tile floors, metal lath, fireproof doors, vaults, safes, grille work, fire extinguishers, bank fixtures.

Swift Current, Sask.
Warehouse for Massey Harris Co., Ltd., Toronto, Ont. General contractors, Tom Barnard, 1121 15th ave., Regina. Basement and one storey nearly finished.

St. Catharines, Ont.
Stable and garage, Ontario St., for J. D. Chaplin. Architect, A. E. Nicholson. General contractor, W. E. Hudson. Three storeys, 30 x 60, brick construction, concrete foundation.

Sackville, N.B.
Stores and flats, cost $4,000, Main, for H. Miller. Architect, W. Doull. Work being done by day labor. Two storeys, 55 x 80, pressed brick construction.

Terrebonne, Que.
Tile plant, cost $18,000, planned for Montreal Concrete Works Co., Ltd., 225 St. James, Montreal. Builders, Owners. Company is in the market for dump carts and all kinds of machinery required for manufacturing concrete, tile and crushing stone.

Toronto, Ont.
Stores and offices, Yonge and Shuter, for Ryrie Bros., 134 Yonge street. Architects, Burke, Horwood & White, 28 Toronto street. Roofing, A. Matthews Ltd., 256 Adelaide W. Painting, F. C. Roberts & Co., 106 Wells street. Heating, plumbing and electrical work, Bennett & Wright, 72 Queen E. Terra cotta, Black Bldg. Supply Co., Mail Bldg. Stone Carving, Watson & Crees, 836 Yonge street.

Addition to factory, cost $5,000, 123 King E. General contractors, Witchall & Son, 163 Havelock street. Two stys., brick construction.

Warehouse, cost $60,000, 439 Wellington street west, for Victoria Paper & Twine Co., 415 King W. Architect, S. L. Yolles, 67 Baldwin street. Five stys., 50 x 210, brick construction and foundation. Old building is being razed. General contractor, architect.

Greenhouse and service building, cost $3,950, for Toronto General Hospital, College St. Builders, King Constr. Co., Dovercourt and Sudbury. Brick and steel construction, asbestos slate roofing, wire glass.

Addition to factory, cost $3,000, for The Armac Press, 42 Agnes St. General contractor, Thos. Lewis, 329 Davenport Rd. Three storeys, brick construction and foundation.

Warehouse, Bloor W., near Railway,

for R. C. Bustard, in trust, Confed. Life Bldg. Architect, J. H. Stanford, Bloor and Ossington. Mason, Hugh Walker, 32 Guelph Ave. Carpenter, F. N. Carr, 146 St. Clements. Two storeys, 90 x 30, brick construction.

Warehouse, 86-90 Chestnut St., for H. Greisman, 68 Adelaide St. E. Architects, Chadwick & Beckett, 18 Toronto St. General contractors, Consolidated Bldg. & Supply Co., 104 Temple Bldg. General contractors will sublet electrical wiring. Four storeys, 48 x 120, brick construction, brick and concrete foundation. Excavating started.

Vancouver, B.C.

Factory, 2034 11th Ave. W., for Alaska Bedding Co. General contractor, F. T. Sherborne. Four storeys, mill construction. Permit issued.

Residences

Dundas, Ont.

Two residences, cost $6,000, James St., for R. L. Biggs, West Flamboro. Architect, Thos. E. Wood, Dundas. Two storeys, brick construction. Plans prepared.

Montreal, Que.

Flats, cost $5,000, Verdun (Wellington), for Hilain Cuerrier, 206 Evelyn. Three storeys, 25 x 60, concrete foundation, brick construction. Plans in progress.

Ottawa, Ont.

Residence, cost $5,000, Brighton, for A. Slack, 282 Flora St. Brick construction, stone foundation. Plans in progress.

Regina, Sask.

Apartment block, cost $40,000, McIntyre and 12th Ave., for F. G. England, 1776 Hamilton St. 50 x 125, brick foundation and construction. Plans in progress.

St. Marys, Ont.

Three residences, cost $7,000. Architect and owner, W. J. Leslie. 1½-stys., cement block contruction, concrete foundation. Plans prepared.

St. Thomas, Ont.

Two residences, cost $6,000, East St., for E. G. Ponsford. Red pressed brick construction, concrete and stone foundation. Plans in progress.

Toronto, Ont.

Two pair residences, cost $8,000, Hounslow Heath Rd., for Wm. Salter, 9 Gillespie Ave. Owner receiving tenders for all trades. Two storeys, 36 x 46, brick construction.

60 residences, cost $2,000 each, Sparkhall and Bain, planned by Toronto Housing Co. Tenders received by owners until Sept. 5th, for masonry, carpentry, plastering and plumbing. Two stys., brick construction and foundation.

Residence, cost $5,000, for H. Seddon, 122 Brock Ave. Architect, E. R. Conlan, 73 Glendale. 2½-storeys, 24 x 30, brick construction. Plans, etc., with owner who wishes general or separate tenders at once.

Walkerville, Ont.

Six residences, cost $9,000, Kildare Rd., for Walkerville Land & Bldg Co. Architects, Stahl & Kinsey, Strathcona Bldg. Two storeys, 29 x 108, pressed brick construction, cement foundation. Tenders received by Architect until Sept. 10th.

CONTRACTS AWARDED

Fort William, Ont.

Apartment block, cost $25,000, for Chas. G. Jenkins, 711 Victoria ave. Architect, R. E. Mason. General contractor, C. E. Ward. Three storeys, 50 x 55.

Hamilton, Ont.

Residence, cost $5,000, Glenfern Ave., for J. E. Lister, 329 Queen St. S. General contractors, Schafer & Stewart, 11 Brant St. Concrete foundation, hollow tile and brick construction.

Residence, cost $3,000, Grosvenor Ave., for J. Novakowski, 30 Clinton St. General contractor, F. Koshewer, 285 Balmoral Ave. Brick construction, concrete foundation.

Montreal, Ont.

Six flats, cost $6,000, Cartier. Owner and general contractor, H. Dubois, 1550 Chabot. Three storeys, 25 x 50, concrete foundation, brick construction.

Four residences, cost $10,000, Belgrave Ave., for John & Wm. Taylor, 2072 Esplanade. Architect, S. Frappier, 2238 Park Ave. General contractors, Owners. Concrete foundation, pressed brick construction.

Residence, cost $16,000, for Carl Riordon, "Amherst House," 374 Cote des Neiges Rd. Architects, MacVicar and Heriot, 104 Union Ave. General contractor, E. B. Evans, 74 St. Denis St. Plastering, Robt. Johnstone, 479 Bleury St. Heating and plumbing, Conroy Bros., 291 Centre St. Tile, Walker Hardware Co., 252 St. James St. 2½-storeys, 23 x 34, stone foundation, brick construction.

Flats, cost $5,600, Verdun (Galt). General contractor and owner, J. O. Mamelin, 246 Church St., Verdun. Three stys., 25 x 53, concrete foundation, brick construction.

Apartment house, cost $190,000, N.W. cor. St. Mark, for P. Du Tremblay, 107 St. James St. Architect, Rene Charbonneau, 15 St. James St. General contractor, roofing, carpenter, painting, heating and plumbing, Alex MacKay, St. Martin and Dorchester. Concrete, Can. Siegwart Beam Co., 17 Place d'Armes Hill. Steel, Dom. Arch. Iron Works, 63 Dalhousie. Plastering, MacIntyre Plastering Co., 55 Latour. Ten storeys, 25 x 93, terra cotta and steel construction.

Ottawa, Ont.

Garage and alterations to residence, cost $10,000, Laurier, for F. W. Carling, Metropolitan Bldg. Architect, C. P. Meredith, 126 Sparks St. Plastering, Jas. McLaughlin, Clemow St. Painting not let.

Regina, Sask.

Residence, cost $10,000. Owner and general contractor, J. W. G. Mills, 2331 Quebec street. 2½ storeys, brick construction, slate roofing. Foundations in.

Residence, cost $7,000, Montreal St. Owner and general contractor, D. A. Morrison, 2130 Broad street. Brick construction. Foundations in.

Residence, cost $25,000, Victoria ave. for T. B. Marshall. Architects, Reilly, Dawson, Hancock & Reilly, 512 Westman Chambers. General contractors, Mackenzie & Jones, Hamilton street. Brick, reinforced concrete, fireproof construction, cut limestone trim.

Residence, cost $6,000, Cameron, for F. H. Field. General contractors, McKenzie & Minshall. 2½-storeys, brick construction and foundation.

Shawbridge, Que.

Cottage, cost $14,000, for Boys' Farm, Shawbridge, Que. Architects, Barott, Blackader & Webster, New Birks Bldg., Montreal. General contractor, P. Jordan, Shawbridge. Owners intend building several cottages from time to time in Shawbridge. Two storeys and basement 49 x 47, concrete foundation, reinforced concrete construction.

Toronto, Ont.

Addition to residence, cost $5,000. Owner and general contractor, H. F. Sanders, 162 Dunn ave. Two storeys, brick construction and foundation. Excavating started.

Two detached residences, cost $10,000, Alberta St. Owner and general contractor, R. Mowbray, 4 Howard St. Architect, J. H. Stanford, Bloor and Ossington Ave. Will sublet some trades. 2½-storeys, 25 x 36, brick construction, stone foundation.

Residence, cost $8,000, York Mills Rd., for Mrs. Chas. Catto, c/o Architects, Page & Warrington, Confed. Life Bldg. General contractor, R. G. Kirby, 539 Yonge St., will sublet some trades. 2½-storeys, brick construction, stone foundation.

Westboro, Ont.

Residence, cost $6,000, City View, for J. E. Caldwell, City View. Architect, C P. Meredith, 126 Sparks St., Ottawa. Carpenter, J. G. Anderson, 126 Sparks St.

Winnipeg, Man.

Residence, cost $16,000, Assinaboine Ave., for Mrs. J. A. Geunell, 84 MacLaren St., Ottawa, Ont. Interested, H. Phillips, 15 Central Ave., Winnipeg. Architect, C. W. W. Chivers, Keewarden Bldg. General contractors, Stainer & Ferguson, 447 Rosedale Ave. Painting, C. D. Haines. Heating and plumbing, Frayer & Magel, 44 Adelaide. Electric, Cowan & Levy, 493 Portage. Tiling, Winnipeg Paint & Glass Co., 389 King St. 2½-storeys, frame and stone veneer construction, stone and concrete foundation.

Power Plants, Electricity and Telephones

Chingaucousy Twp., Ont.

Twp. Council has granted Shale Products Co., Inglewood, permission to erect poles for transmission line on 2nd Concession to convey electric power.

Dereham Twp., Ont.

By-law passed granting Southern Ontario Gas Co. right to lay mains in above Twp. Further information from Alex. Bell, Clerk, Verschoyle, Ont.

Medicine Hat, Alta.

Electric sub-station, cost $10,000, planned by City Council. City Engineer, A. K. Grimmer. General contractors, Sackrider & Turner Co., Main and Railway streets. One storey, brick construction.

Montreal, Que.
Electric lighting system, cost $2,542, planned by Board of Commissioners. Sec., L. N. Senecal. Electric, Sayer Elec. Co., 87 Bleury St.

Ottawa, Ont.
Tenders received by Chairman, Mayor, J. A. Ellis, till Sept. 10th for 95 ornamental iron posts with 475 spring suspension sockets and fittings, each post to carry 4 invester lamps with 1 upright lamp, same design as used on Bank and Queen Sts. Engineer, Supt. Brown, City Hall. Specifications at office of Supt.

Port Hope, Ont.
Extension to electric power system, cost $10,000, planned by the Seymour Power Co.; have been granted ten year franchise.

Strassburg, Sask.
Electric power house. Sec.-Treas., S. L. A. Smith. Con. Engineer, R. L. Biggs, of Winnipeg Engineering Co. General contractors, James & McKay, Semans, Sask. Contract for 1 Ruston Proctor 50 h.p. engine let to the British Canadian Engineering & Supply Co., Ltd., Phoenix St., Winnipeg. Contract for electric apparatus, poles, line, etc., let to the Canadian General Electric Co., Ltd.

Winnipeg, Man.
Generators, cost $103,800. Engineer, J. G. Glassco, 54 King street. General contractors, Canadian Westinghouse Company, Ltd., Portage ave. east., for the manufacture, delivery and installation of generators for the extension of power plant at Point du Bois.

Yorkton, Sask.
Telephone exchange, cost $18,000, planned by Dept. of Railways & Telephones, Regina. Minister, Hon, J. A. Calder, Regina. General contractors, Logan & Black. Heating and plumbing, Parrott & Byers, 4th St. Three storeys.

Miscellaneous

Deep River Islet, Ont.
Lighthouse tower, Renfrew County, planned by Dom. Govt., Dept. of Marine and Fisheries. Deputy Minister, A. Johnston. For construction of wooden lighthouse tower. Plans, specifications, etc., at offices of Dept., Ottawa and Post Offices at Pembroke, Fort William, Fort Coulonge, Chapeau and Cobden. Tenders received by Deputy Minister until Sept. 8th.

Ft. William, Ont.
Addition to car barns, cost $40,000, Walsh. Mayor, R. Graham. General contractor, P. J. Donohue, Room 1 Cameron Block, Mary St. One storey, 270 x 28, brick construction, cement foundation.

Galt, Ont.
Retaining wall planned by town council. Clerk, James McCartney. To be erected on west side of river.

Hamilton, Ont.
Addition to store, cost $5,000, King E., for Walter Howell, Emerald and King Sts. Architects, Malls & Hutton, Bank of Hamilton Bldg. General contractors, Hogan & Farr, 15 Fairholt Ave. Carpenter, Haste & Milne, c/o General Contractor. Painting, W. J. Robertson, 33 Erie Ave. Plumbing, Adam Clark, 7 Main St. W. Two storeys, stone foundation, brick construction.

Humboldt, Sask.
A new public school has been recommended for the town. To cost about $65,000.

London, Ont.
Addition to cold storage building, cost $15,000, for London Cold Storage Co. Manager, M. Mausuret. General contractors, Jno. Hayman & Sons. Two storeys, 100 x 58, white brick construction, stone and concrete foundation.

Garage and warehouse, cost $20,000, for F. G. Mitchell, c/o London Engine Supplies Co. Architects, McBride & Fairfield, Edge Block. Two storeys, white brick construction, stone and concrete foundation. Plans in progress.

Maccan, N.S.
Reinforced concrete dam, cost $11,000, for The Maritime Coal, Railway & Power Co. General contractors, The Ambersen Hydraulic Constr. Co., Ltd., New Birks Bldg., Montreal, Que. 200 ft. long, 20 ft. high. To be used for water supply purposes.

Medicine Hat, Alta.
Stores, cost $10,000, 6th Ave. and Balmoral St., planned for C. J. Hall, Real Estate, Toronto St. Architects, Bourne & Morrison, Huckvale Block. One sty., 80 x 130, red brick and stone construction, cement foundation, store fronts and fixtures. No contracts awarded yet.

Merritt, B.C.
Armory, planned by Dom. Govt., Dept. of Militia and Defence. Secretary, E. J. Jarvis. Plans, etc., at offices of District Officer Commanding Military District No. 11 Victoria, and at Director-General of Engineer Services, Ottawa. Tenders received till Sept. 11th at Dept., Ottawa.

Montreal, Que.
Alterations to moving picture theatre, cost $5,000, St. Lawrence, for Societe St. Jean Baptiste, 296 St. Lawrence. Architect, Eng. Payette, 103 St. Francois Xavier St. General contractor, B. Sauve, 482 Colonial. Stores are to be altered to moving picture theatre. Five storeys, 160 x 115, concrete and stone foundation, felt and gravel roofing.

Ottawa, Ont.
Ice breaker required by Dom. Govt., Dept. of Marine & Fisheries. Sec. and Deputy Minister, A. Johnston. 275 ft. long, 57 ft. wide, 32 ft. deep. Draught 20 ft., 9,000 h.p. To operate between Montreal and Quebec. Tenders to be called.

Additions to city hall, Elgin St., planned. Mayor, J. A. Ellis. Architect not chosen. Two wings are contemplated to be erected. Four storeys.

Stores and offices, cost $110,000, Queen street, for Bryson Realty Co., Queen St. Architect, A. L. Weeks, 75 Sparks St. General contractor, mason and carpenter, Alex. Garvock, Lewis St. Heating and plumbing, M. M. O'Connell, Gloucester St.

Residence, cost $5,000, Cameron St. Architect and general contractor, Sam J. Lucy, 1147 Bank St. 2½-storeys, 24 x 23, brick construction, stone foundation. Excavating started.

Residence, cost $6,000, Woodlawn, for Andrew McArthur, 26 Woodlawn Ave. Solid brick construction, stone and concrete foundation. Plans in progress.

Seaforth, Ont.
Barracks, cost $7,000, for Salvation Army. Major, F. Morris, Clarence St., London. Architect, Major Miller, Toronto. Two storeys, white brick construction.

Stratford, Ont.
Improvement to sewage disposal plant planned by City Council. Mayor, C. N. Greenwood. Clerk, R. R. Long. Engineer, A. B. Manson, City Hall. Plans and specifications at office of Engineer. One Humus bed, chlorination devise, new sedimentation tank and auxiliary gas engine.

Factory, cost $35,000, Douro, for Farquharson-Gifford Co., Douro St. Architect, J. S. Russell, 21 Douro St. General contractor, mason, carpenter and steel, J. L. Yongs, 240 Birmingham St. Painting, G. L. Money. Plumbing, Peter & Sylvester. Roofing and electrical not let yet.

Toronto, Ont.
Two passenger lake steamers contemplated by C. N. O. Ry., head office, Toronto. General manager, M. H. MacLeod, Winnipeg. Probable contractors, Western Dry Dock & Shipbuilding Co., Ltd., Port Arthur.

Winnipeg, Man.
Lead covered cable, cost $4,613. Engineer, J. M. Glassco, 54 King St. General contractors, Imperial Wire & Cable Co. Board of Control, Secretary, M. Peterson.

New Companies

The Westport Rural Telephone Company, Ltd., has been incorporated with a capital of $7,000, to carry on business as a general telephone company, with head office at Westport. The provisional directors are W. S. Ripley, insurance agent, J. F. McNally, and M. E. Mulvill, general merchants, all of Westport.

Model Homes, Limited, incorporated with a capital of $40,000, to carry on business as a general land and building company, with head office at St. Catharines. The provisional directors are W. A. Notman, R. L. Notman, and H. C. Babel, all of Buffalo.

Ormeau Park Land Company, Ltd., has been incorporated with a capital of $40,000, to carry on business as a general land and building company, with head office at Toronto. The provisional directors are John Ferguson, builder, J. W. Payne, barrister and S. A. Keers, broker, all of Toronto.

Cartier Realty Limited, incorporated with a capital of $50,000, to carry on business as a building company and dealers in building material, with head office at Ottawa. The provisional directors are J. R. Touchette, J. F. H. Laperriere and Hector Laperriere, all accountants, of Ottawa.

Zebrun and Baben Construction Company, Limited, has been incorporated with a capital of $50,000 to carry on a

Tenders and For Sale Department

NOTICE

Extension of Time

Town of Neepawa, Manitoba

Tenders for Machinery

Sealed tenders will be received up to noon, **Friday, Sept. 12, 1913**, for machinery for additions to the power plant at Neepawa, as follows:—

Specification Section No. 1—Two 72 in. x 18 ft. Boilers.

Specification Section No. 2—One 187½ h.p. Engine.

Specification Section No. 3—One 150 k.v.a. Generator, Switchboard, etc.

Specifications may be seen at the offices of the Electrical News, or obtained from W. F. Skinner, Limited, 204 Sterling Bank Bldg., Winnipeg, or from the undersigned:

J. W. BRADLEY, Sec.-Treas.,
Neepawa, Man.

35

Sealed tenders addressed to the undersigned, and endorsed "Tender for Extension and Repairs to Revetment Wall at Meaford, Ont.," will be received at this office until 4 p.m. on **Monday, September 29, 1913**, for the construction of an Extension and repairs to the Revetment Wall at Meaford, Grey County, Ont.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department and at the office of J. G. Sing, Esq., District Engineer, Confederation Life Building, Toronto, Ont.; J. H. Armstrong, Esq., District Engineer, Midland, Ont., and on application to the Postmaster at Meaford, Ont.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, August 27, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—46238. 36-37

Town of Goderich

Tenders For

Cement Concrete Walks

TO CONTRACTORS

The Municipal Council of the Town of Goderich invite tenders for the construction of approximately 14,500 square feet of cement concrete sidewalk on Nelson, Park and Wellesley Streets and Britannia Road in the Town.

Specifications can be seen and full information can be obtained on application to the Engineer in charge, J. Ades Fowler, C.E., or from the undersigned.

Tenders in sealed covers marked "Tender for Cement Walks," and accompanied by a marked cheque for 5 per cent. of their amount will be received up to and including **Thursday, September 11th, 1913**, addressed to

L. L. KNOX, Town Clerk,
Goderich, Ont.

Neither the lowest or any tender will necessarily be accepted. 36

Sealed tenders addressed to the undersigned and endorsed "Tender for Interior Fittings, Post Office, Port Arthur, Ont.," will be received until 4 p.m. on **Thursday, September 18, 1913**, for the work mentioned.

Tenders will not be considered unless made upon forms furnished by Department, and in accordance with conditions contained therein.

Plans and specifications to be seen on application to Mr. D. McKenzie, Caretaker, Port Arthur, Ont.; Mr. T. A. Hastings, Clerk of Works, Postal Station "F," Toronto, Ont., and at the Department of Public Works, Ottawa.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
—47186. Ottawa, August 30, 1913. 36

Tenders Wanted

Sealed tenders will be received up to noon on the **16th day of September, 1913**, by the undersigned at Cayuga, Ontario, for the construction of twenty-six and one-half miles of stone macadam road in the County of Haldimand.

The work will be let in three separate and distinct contracts, not necessarily to the same individual.

Tenderers are required to examine the localities of the work and are required to be present at the opening of the tenders at 2 p.m. on Wednesday, the 17th day of September, 1913.

Plans and specifications may be seen at the office of the County Engineers, Messrs. Jackson & Kyd, Dunnville, or may be had from them on the payment of $10, which sum will be refunded on return of the documents.

Lowest or any tender not necessarily accepted.

T. A. SNIDER, K.C., County Clerk,
County of Haldimand,
32-37 Cayuga, Ont.

Some Good Machines

Buckeye Trenching Machine, 12 in. x 4½ ft, A1	$700
Buckeye Trenching Machine, 27 in. x 8 ft.; just through shops; as good as new	$2,500
Parsons Trenching Machine, 2 ft. x 5 ft. to 20 ft. deep. A1	$3,500
Thew No. 0 Steam Shovel. Overhauled by Thew Manufacturers last year. A1	$2,800

TRACTION ENGINE

Located in Canada, 30 H.P.

undermounted, double Avery machine, coal burner with rear mounted Steel Water Tank. Also an Avery Steel Water Tank on truck with pump. Cost, new, $3,575. This is in first-class condition $1,800

WHAT DO YOU NEED IN SECOND-HAND EQUIPMENT?

TRY US!

WILLIS SHAW MACHINERY CO.

La Salle Street, Chicago. Ill.

Proposed Government Buildings

OTTAWA, ONTARIO

Architects are invited to submit sketch designs in a preliminary competition for the erection of Departmental and Courts Buildings.

From the designs submitted in this preliminary competition, six will be chosen by the Assessors, the authors of which will be invited to submit more matured designs in a final competition, for which the five unsuccessful competitors shall each receive an honorarium of Three Thousand Dollars ($3,000).

The author of the design placed first by the Assessors will be entrusted with the work which the Government intends carrying out at once.

The competition is limited to British subjects practising in the British Empire.

The Government has appointed Mr. T. E. Collcutt, Mr. J. H. G. Russell, and Mr. J. O. Marchand, as Assessors to act in its behalf.

The design in the first competition must be delivered in Ottawa (carriage paid) not later than 12 o'clock noon, 2nd January, 1914, addressed to the undersigned.

Conditions for both competitions may be had on application to the undersigned, and at the office of the High Commissioner for Canada, 17 Victoria Street, London, England.

By order,

R. C. DESROCHERS.
Secretary.

Department of Public Works,
Ottawa, August 18, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—44890. 36-37

Special Notice

Every man who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works are advertised.

Send along your plans when asking for tenders put a line in your advertisement to that effect.

No extra charge is made for filing plans at one or all four offices.

Contract Record and Engineering Review

Montreal—119 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—429 Pender Street.

Board of Education

Sealed tenders, whole or separate, addressed to the Secretary-treasurer of the Board, will be received until

Friday Noon, Sept. 12th, 1913

for the several trades required for the

Enlargement of
Shirley Street School and Parkdale School

Specifications may be seen, and all information obtained at the office of the Superintendent of Buildings, City Hall. Each tender must be accompanied with an accepted bank cheque for five per cent. of the amount of tender or its equivalent in cash. Tenders must be in the hands of the Secretary-treasurer at his office in the City Hall not later than 12 o'clock noon on the day named, after which no tender will be received. The lowest or any tender will not necessarily be accepted.

W. O. McTAGGART,
Chairman of Committee.
W. C. WILKINSON,
Secretary-Treasurer.

36

New Companies

(Continued from page 75)

general contracting and constructing business, with head office at Toronto. The provisional directors are Leo. Macaulay, J. E. Anderson, law students, and R. D. Moorhead, solicitor, all of Toronto.

Eglinton Park, Limited, has been incorporated with a capital of $150,000 to carry on business as a land and building company, with head office at Toronto. The provisional directors are H. R. Moses, law student, C. W. O. Goshorn, G. D. Waters, cashiers, all of Toronto.

Newcastles, Limited, incorporated with a capital of $200,000 to carry on a general land and building business, with head office at Toronto. The provisional directors are G. D. Waters, C. W. O. Goshorn, cashiers, and J. J. Flint, accountant, all of Toronto.

Goodwin Park, Limited, has been incorporated with a capital of $40,000 to carry on business as a general land and building company, with head office at Hamilton. The provisional directors are G. W. Tinlin, F. H. Jory, fruit growers, and G. A. Tinlin, farmer, all of the township of Clinton.

Emil Anderson Company, Limited, incorporated with a capital of $200,000, to erect buildings and deal in building material, with head office at Fort William. The provisional directors are Louise Kreutzinger and Matilda Kreutzinger, of Palmerston, Ont.

Exmoor Realty Company, Limited, has been incorporated with a capital of $150,000, to carry on business as a general land and building company, with head office at Toronto. The provisional didectors are L. F. Black, H. A. Hall, accountants, and G. D. Waters, cashier, all of Toronto.

Business Notes

Goderich, Ont.
Furniture factory, owned by The Kensington Furniture Co., burned. Loss, $40,000. Manager, J. A. Rumball. Will likely rebuild.

Jarvis, Ont.
Freight sheds owned by Grand Trunk Railway Co., burned.

Kincardine, Ont.
Stables and barns of John McIntyre burned. New buildings to be erected at cost of $3,500, basement of cement or stone, concrete floors.

Lennoxville, Que.
Residences owned by Mrs. Geo. Reed, S. A. and R. C. McFaden, burned; loss about $10,000.

London, Ont.
Exhibition buildings owned by Western Fair Board, burned. Secretary, A. M. Hunt. Machinery Hall, Transportation Bldg., W.C.T.U. Dining Hall, and main horse stable destroyed. Loss $100,000.

Mayfield, Sask.
Implement warehouse owned by White Bros., burned, loss $2,500. E. B. McKay, general store, $4,000.

Montreal, Que .
Cooper shop of John Paxton & Co., Drolet street, burned, loss $8,000. Machinery destroyed.

Melville, Sask.
Barn and residence, owned by T. Mazarch, burned; loss $6,000.

Revelstoke, B.C.
The West Kootenay Steam Laundry destroyed by fire. Loss, $16,600. Insurance, $5,000.

Sault Ste. Marie, Ont.
Power plant of Lake Superior Corporation partly destroyed by fire. Loss heavy.

Ste. Agathe, Que.
Saw mills, owned by The Ste. Agathe Des Monts Saw Mill Co., burned. Loss, $20,000, some insurance. Will rebuild. Chevalier & Co., loss, $15,000 to $20,000. Will rebuild.

Ville Marie, Que.
Store, owned by Bergeron & Freres, destroyed by fire. Loss, $8,000. Company will rebuild. Stock of implements, carriages, etc., destroyed.

Unclassified Items

Ottawa, Ont.
Water pipe material required in connection with the relaying of 40-in. steel water pipe. Steel expansion joints, corrugated steel sleeves, plain steel sleeves, steel flanges, gaskets, bolts, nuts, rivets, etc. Tenders received by Chairman Waterworks until September 6th. Engineer, Arch. Currie.

Swift Current, Sask.
Water works, cost $88,000, planned by Town Council. Mayor, I. E. Argue. Sec.-treas., Geo. D. Arnott. By-law to be submitted to ratepayers on Sept. 8th.

Regina, Sask.
Concrete sidewalks, cost $85,000, planned by City Council. City Engineer, F. McArthur. General contractors, Western Pavers Ltd. 500,000 sq. ft. sidewalks; 10,000 sq. ft. concrete crossings.

Toronto, Ont.
Sewers planned by Board of Control. Mayor, H. C. Hocken. Commissioner of Works, R. C. Harris. East Toronto Section "A" Outlet awarded to Commissioner of Works, $86,000. General contract, Balsam ave., Queen to Kingston Rd., to J. H. McKnight Construction Co., 88 St. David street, $45,900; Woodbine ave., to McLaughlin Bros., $6,490.

St. John, N.B.
Wharf, cost $9,800, East side Ferry Slip. Commissioner, H. B. Schofield. General contractors, Robert Roberts & Sons, 52 Cunard street.

Swift Current, Sask.
Fire Hall, cost $28,000, contemplated. Mayor, I. E. Argue. Sec.-treas., Geo. D. Arnott. By-law will be submitted to ratepayers on Sept. 8th.

Berlin, Ont.
St. Paul's School, cost $4,000, Church street. Architect, C. Knechtel. Plumbing, Hollinger & Durst, Frederick St.

Fort William, Ont.
Addition to Orphanage, cost $25,000, Franklyn, planned by Roman Catholic Denomination. Architect, H. R. Halton, Shanley Block. General contractors, C.

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High Class Artificial Stone Company requires agents in every city to sell building stone, ornamental work, pipes, roof and floor tiles, etc. Liberal commission allowed. Address C. P. c/o "Contract Record," Toronto. 36-37-38

Mathieu. Masonry, Stinn Bros. 3½ storeys, 50 x 100. Foundations in.

Brockville, Ont.
Theatre, cost $20,000, for John McLennan. Architect, A. Stuart Allister. Electrical work, A. G. Dobbie & Co.

Hamilton, Ont.
School, cost $136,000, Cannon St. E. Secretary, R. H. Foster. Architect, A. W. Peene, Clyde Block. General contractor, W. H. Yeates, 24 Leeming St.

Winnipeg, Man.
Church, cost $50,000, Cathedral ave., for St. John's Presbyterian Church. Pastor, Rev. J. P. Jones, Bannerman ave. Architect, R. L. Smith, Somerset Bldg. General contractors, Fraser & McDonald, 510 Gertrude ave. For basement only. Remainder of work will be done next year.

East Oakland, Ont.
Cattle and implement buildings, cost $5,000, for Wm. Harkness, West River Rd., Galt P.O. Fireproof construction, stone and concrete foundation, galvanized iron, metal shingle on asbestos roofing. Plans in progress.

Kinloss, Ont.
Cattle buildings, cost $3,000, for Alex. McKenzie, Kinloss, Lucknow P.O. Fireproof construction and concrete foundation. Plans in progress.

Montreal, Que.
Alterations and addition to Molsons Brewery, 906 Notre Dame E., planned. Architect, Mr. Hetlinger, c/o Molsons Brewery. Tenders called by architect for painting and glazing of bottling and beer department.

Toronto, Ont.
Dry kiln, cost $3,000, King and Bathurst, for Otto Higel Co., King and Bathurst. Architects, G. M. Miller & Co., 93 Yonge street. Tenders received by owners. One storey, brick and reinforced concrete construction, concrete foundation.

Hamilton, Ont.
Store, cost $2,500, Balmoral avenue. Owner and general contractor, Wm. Addy, 1 Cedar ave. Brick construction, concrete foundation.

Alterations to hotel, cost $12,000, for Staunton Bros., Revere House, King St. E. Architect, A. W. Peene, King St. W. Roofing, Dennis & Jocelyn, 13 Walnut St. S.

Toronto, Ont.
Garage and storage, cost $2,500, Esplanade. Owner and general contractor, Elias Rogers Co., 28 King St. W. Two storeys, 22 x 46, frame and galvanized iron construction, concrete foundation, felt and gravel roofing, electric lighting.

Vanvouver, B.C.
Can factory, cost $75,000, Railway St., for the American Can Co. General contractors, J. Carver & Sons, 305 Duncan Bldg. Three storeys, brick and mill construction.

Winnipeg, Man.
Bank building, cost $15,000, Main St. N., for Merchants Bank of Canada. Architects, J. D. Atchison & Co., Union Bank Bldg. General contractors, G. A. Fuller & Co., Union Bank Building. Steel, Manitoba Bridge & Iron Works. Roofing, A. B. Ormsby & Co. Painting, R. Crawford. Electrical work, Shipman Elec. Co. Ltd. Interior fittings, Scott Graff Lumber Co., Duluth, Minn. Heating and plumbing not let yet. 2½ stys., 31 x 64.

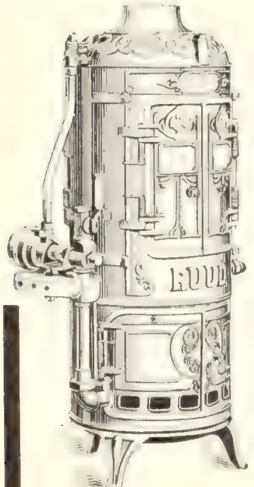
Hamilton, Ont.
Six residences, cost $12,000, Belmont ave., for A. Hines, 21 Barton Street W. Tenders received by architect, J. D. Corrigan, 231 Catherine N. Brick construction, cement foundation.

Montreal, Que.
Residence, cost $4,000, Lachine, 45th street, planned for Mrs. Nap. Vallee, Coteau du Lac. Two storeys, 28 x 38, cement foundation, pressed brick construction.

Halifax, N.S.
Residence, cost $5,000, LeMarchant, for David Gray, LeMarchant St. General contractor, masonry and carpentry, Watson Gray, 60½ LeMarchant St. 2-storeys, 50 x 25, cement foundation, frame construction.

Hamilton, Ont.
Apartment house, cost $18,000, Sherman ave., for P. G. Colvin. General contractors, Sparks & McKay, 133 Cannon St. E.

Montreal, Que.
Residence, cost $4,000, Lachine, 11th street. Owner and builder, T. Legault, 138 11th ave. Three storeys, 40 x 50, stone foundation, pressed brick construction. Excavating started.



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Hull B.C. Fir 80' x 30' 7"
Hoisting Engines, 10 x 12
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Boom, steel, 90 ft. long, in 4 sections
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Spuds are raised by friction hoists
Accommodation for full working crew
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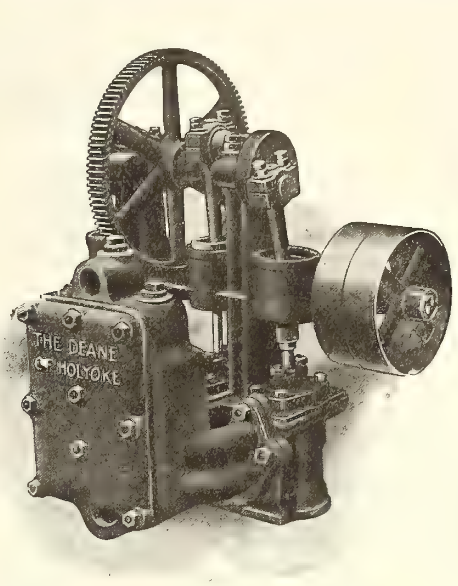

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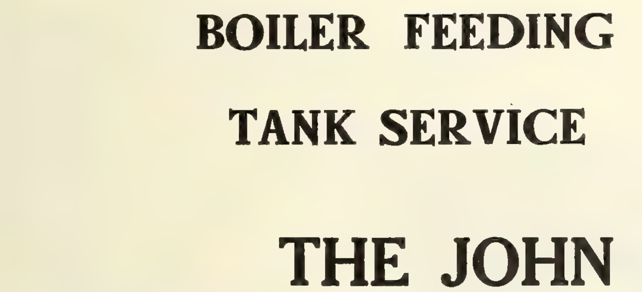

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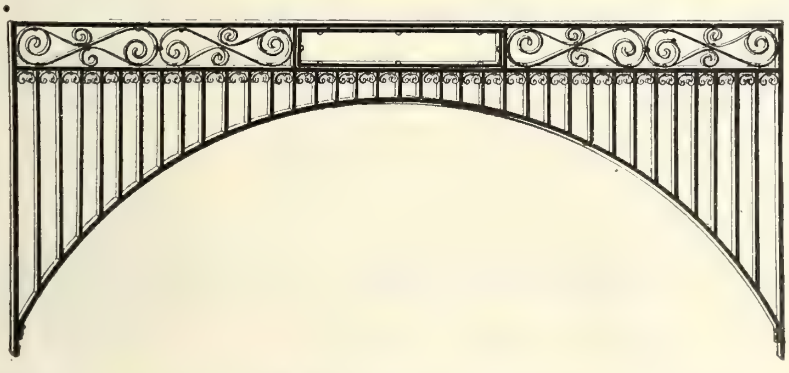

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The efficiency of the No. 7 Hammer assures it to be the Contractors best friend. The piston weighs 800 pounds and strikes 4 powerful blows per second, total weight is 5,000 lbs.

High Power
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Accelerating Piston
a Basic Patented
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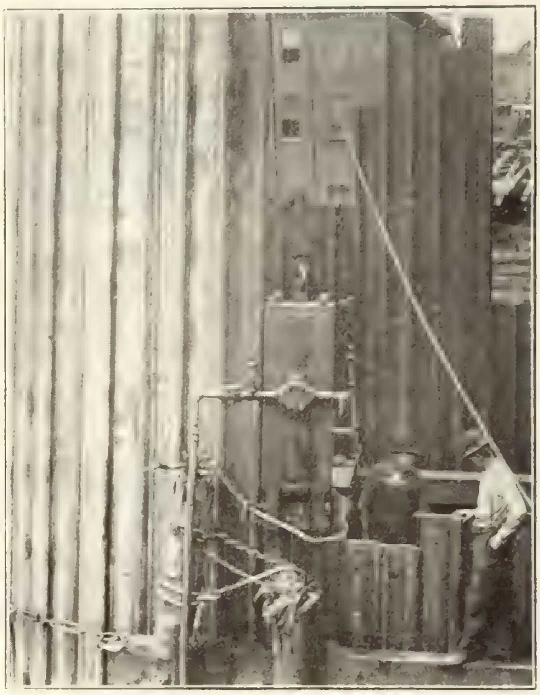

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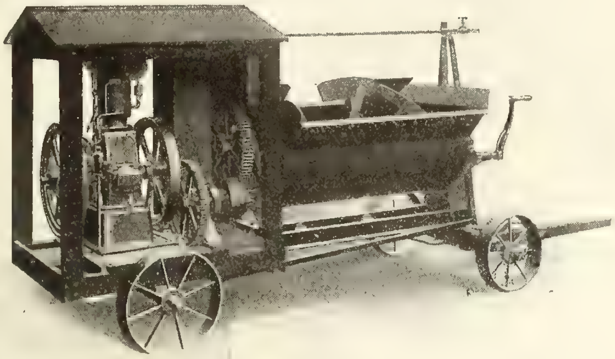

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You will do your concrete mixing quicker and cheaper with the Blystone Mixer. This is not what we alone say but what all users say. This mixer is adaptable to all kinds of work. We are willing to prove its advantages to you—give us the opportunity.

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Don't buy any lathing until you give us an opportunity to send you a sample and complete information about "Hayes" Patent Steel Lath. Indispensible for fireproof construction and the most economical for any kind of construction. The positive key of this lathing insures the plaster holding even when attacked by fire and water. Especially adapted for tile work. It will pay you to get all the facts about "Hayes" Patent Metallic Lath. Correspondence invited.

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Made in Two Sizes

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8,000 Candle Power, operates 12 Hours on 18 lbs. Carbide.

Price F.O.B. Ottawa $95.00.

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1,000 Candle Power, operates 12 Hours on 8 lbs. Carbide.

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40—4 Yard Dump Cars 36″ Gauge (at a Bargain)
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The above machines are but slightly used and are in good working order.

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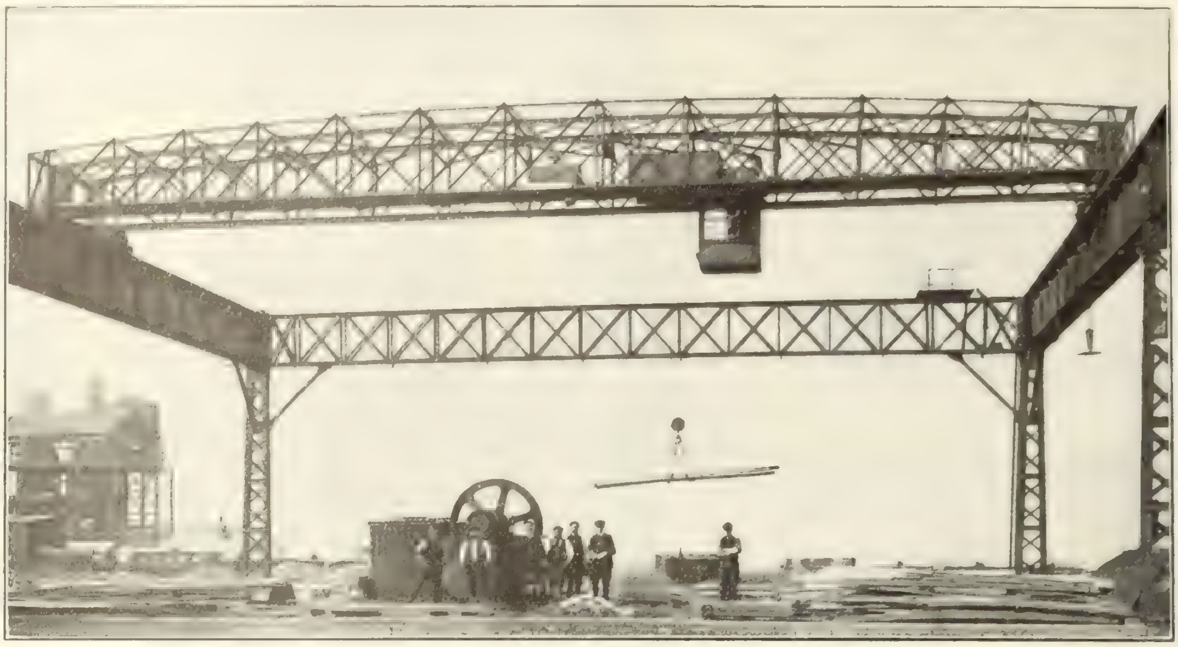

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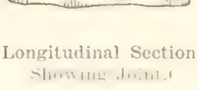
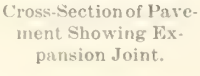


Longitudinal Section Showing Joint.



Cross-Section of Pavement Showing Expansion Joint.

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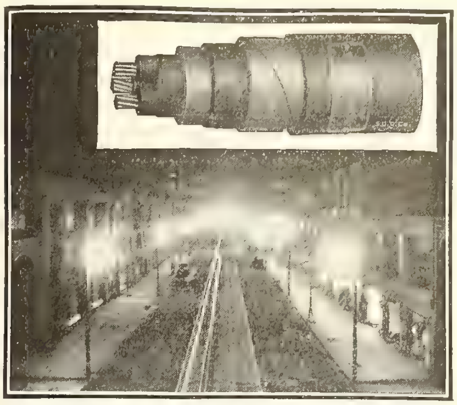

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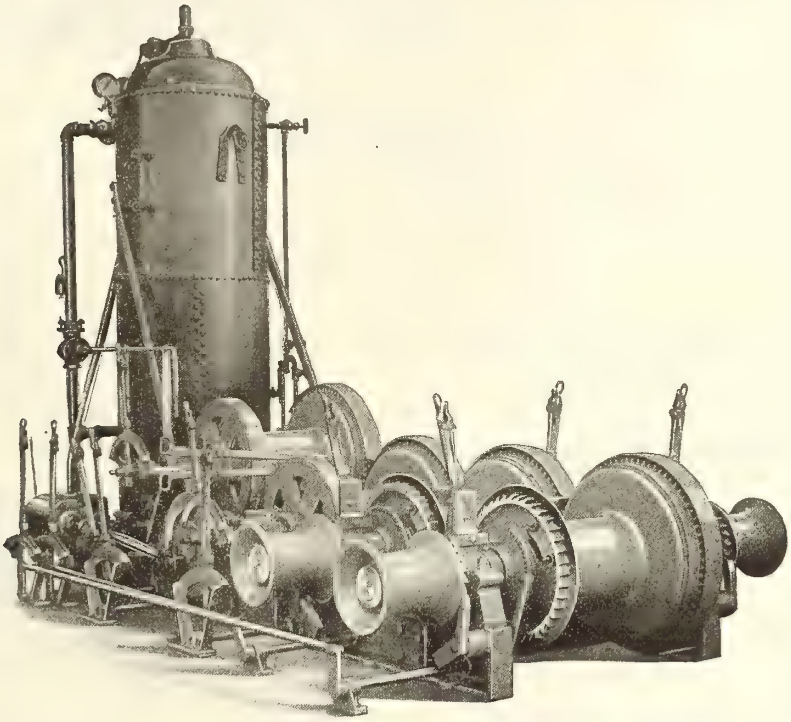

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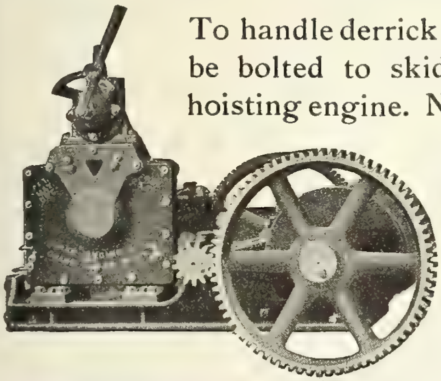

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Radial Brick chimneys are the only type that will not deteriorate from the effects of gases and erosion.

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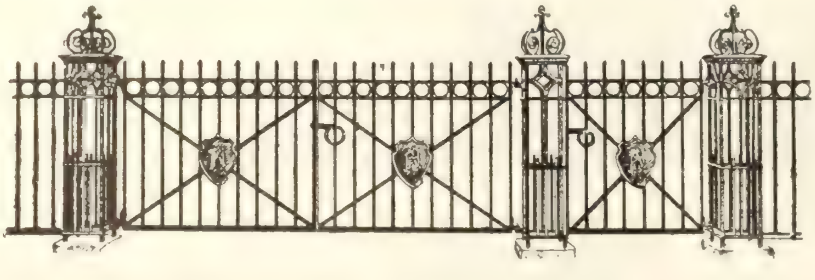

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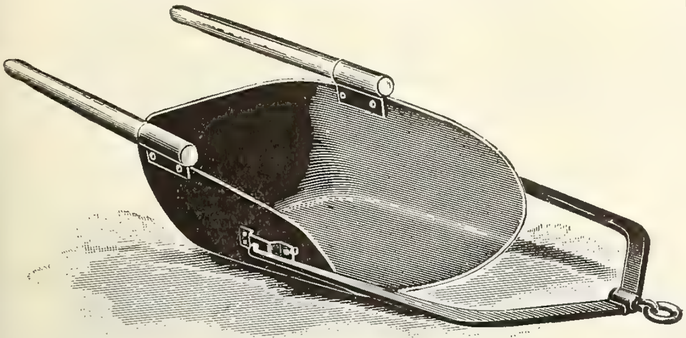

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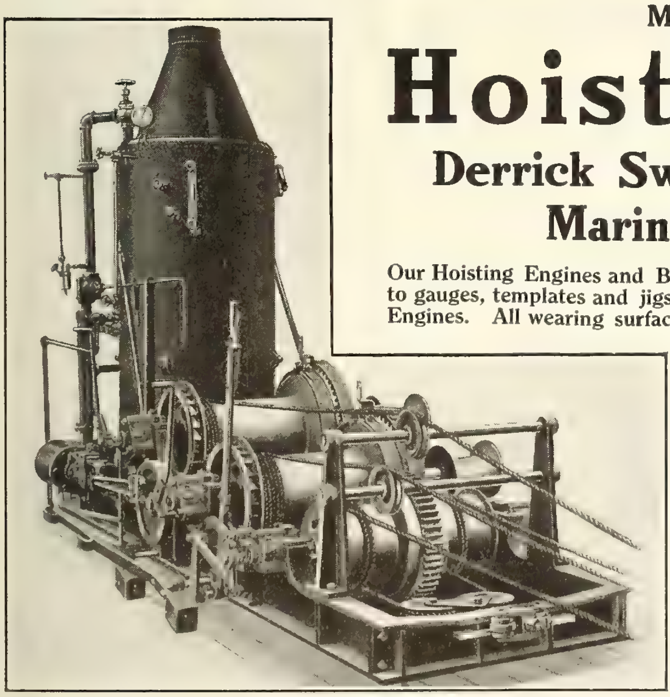

The above half tone illustrates our Standard double Drum double Cylinder Hoisting Engine with Derrick Swinger attached.

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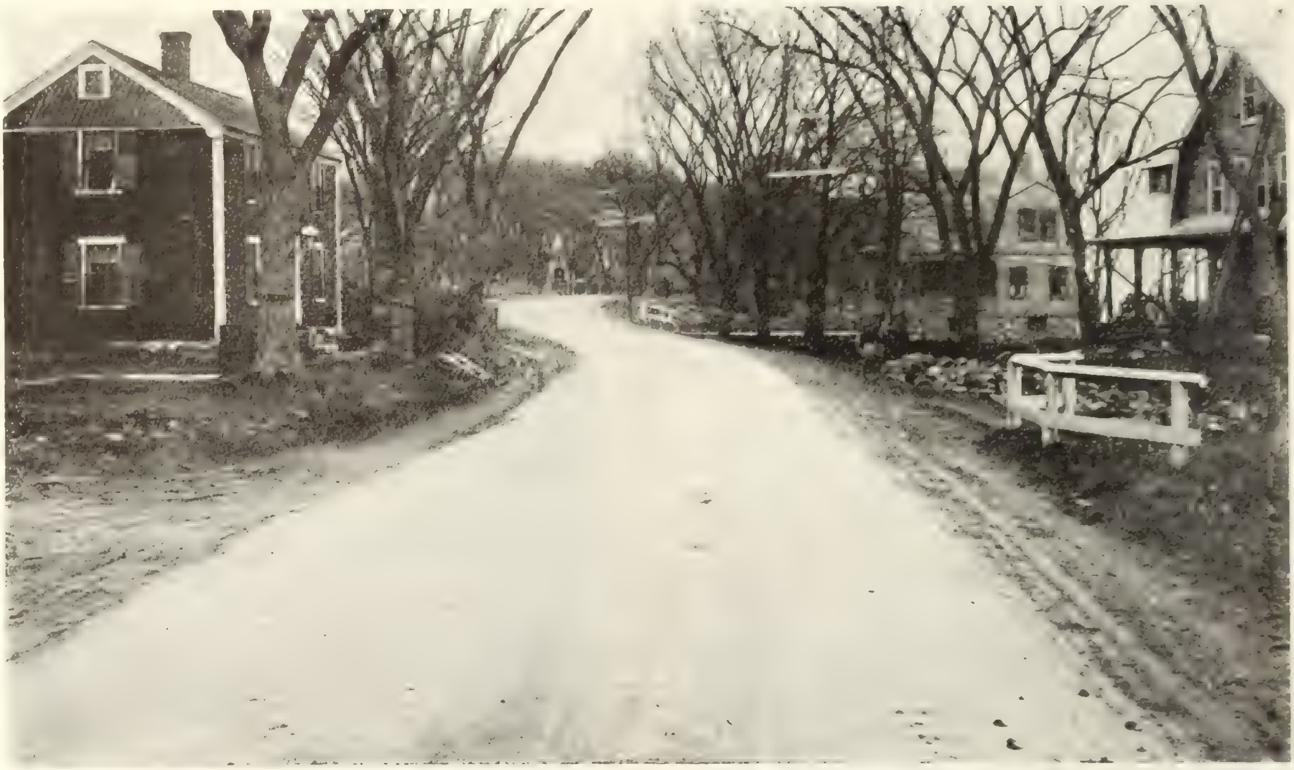

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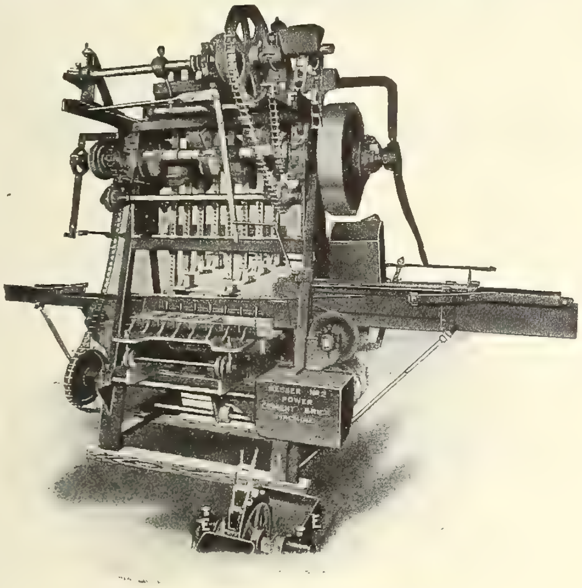

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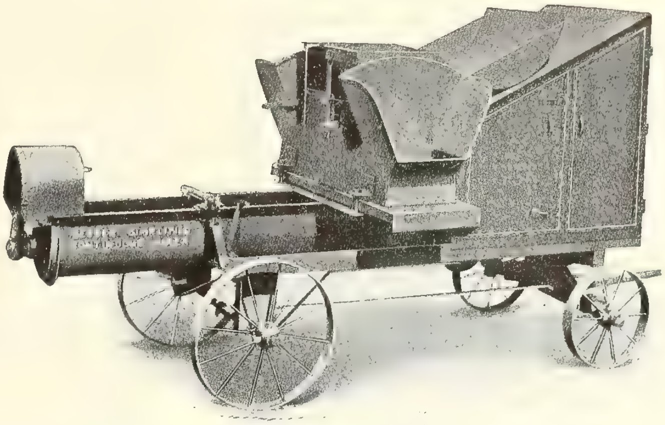

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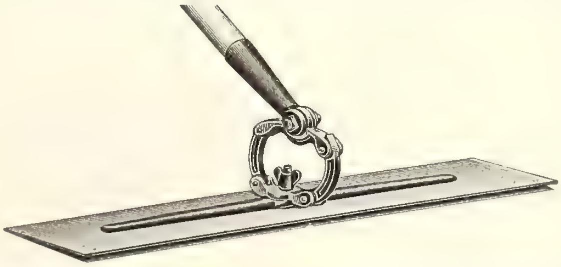

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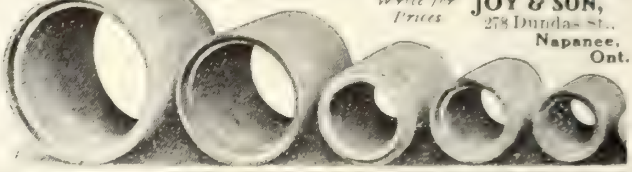

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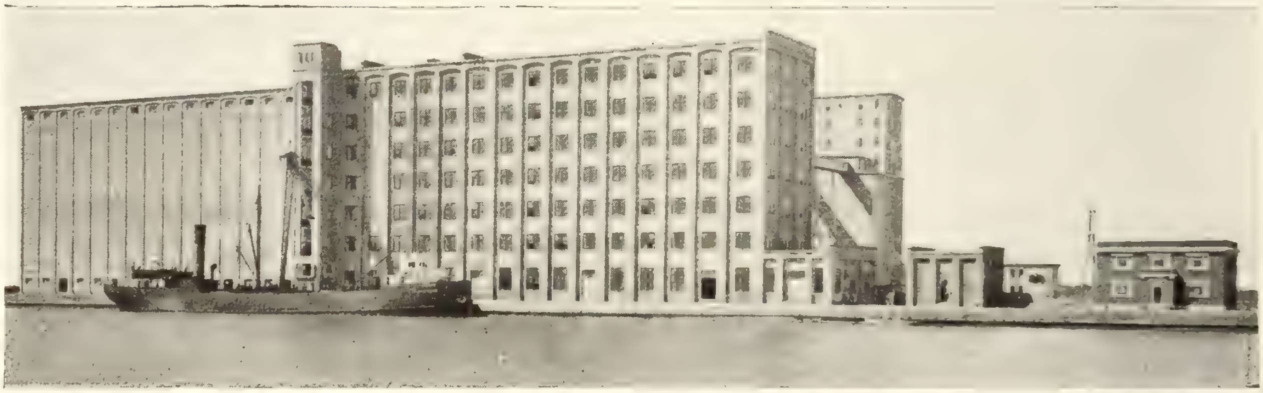

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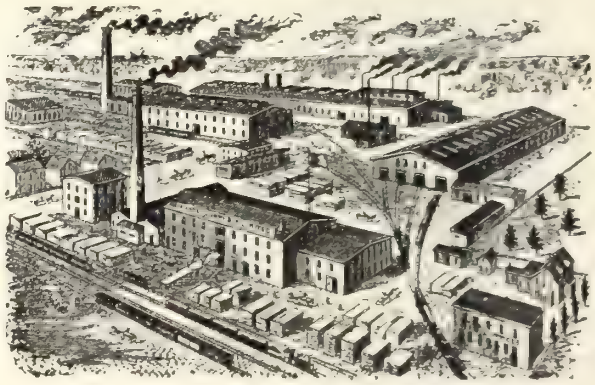

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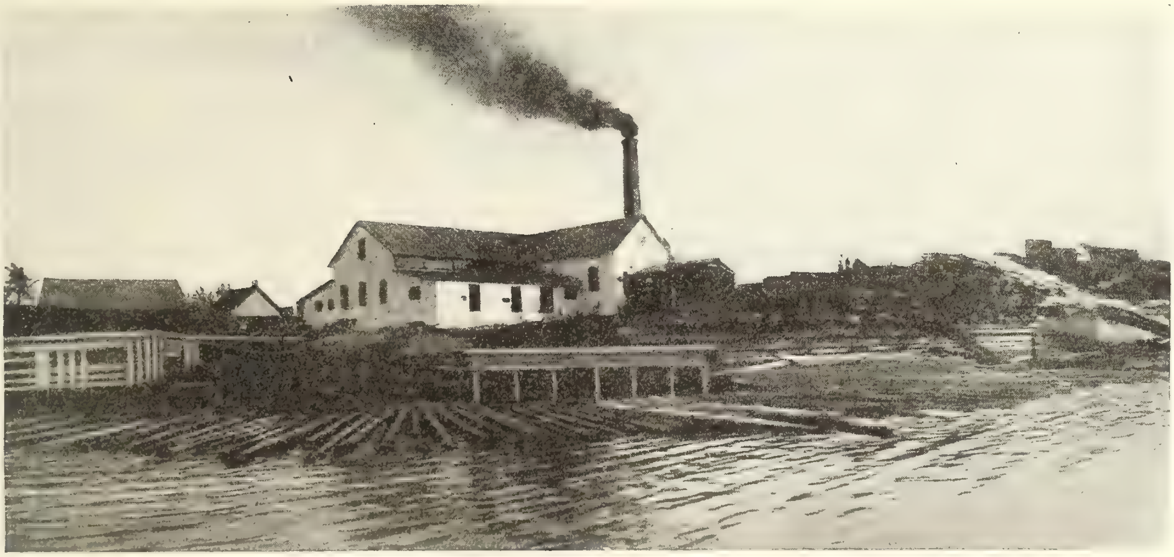

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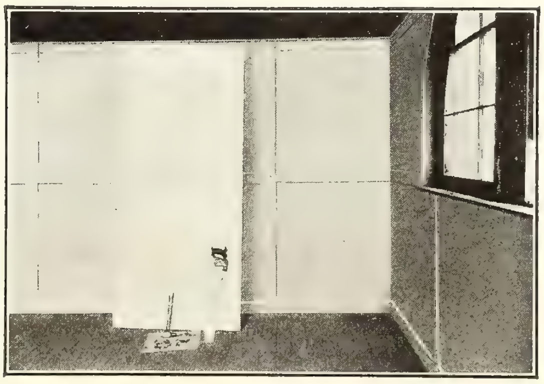

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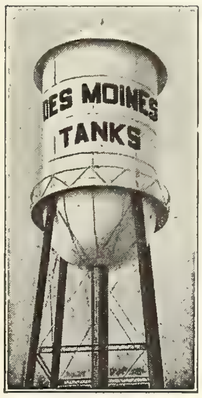

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67 Victoria Street, - Toronto
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Contractor for **Cold Storage Buildings, Abbatoirs, Creameries** and similar structures where the insulation or waterproofing requirements call for special attention.

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FOR SALE
"TAMCO" Crushed Stone in all sizes, for all purposes.
"Roman" building stone.
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Sanitary flooring, stone crushers, fire engines, &c.
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MANUFACTURERS OF

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Samples Furnished and Prices Quoted on Application

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Products all Made in Canada

Toronto, Ont. **Fenestra** SOLID STEEL WINDOWS Montreal, Que.

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Toronto, Canada

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Send for our Catalogue of Asphalt Rollers and Mixers.

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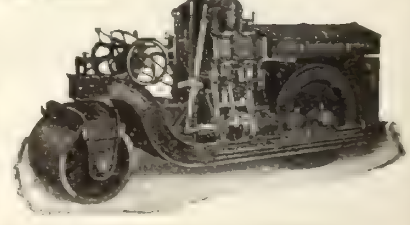

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1303 Peach Street, - Erie, Pa.

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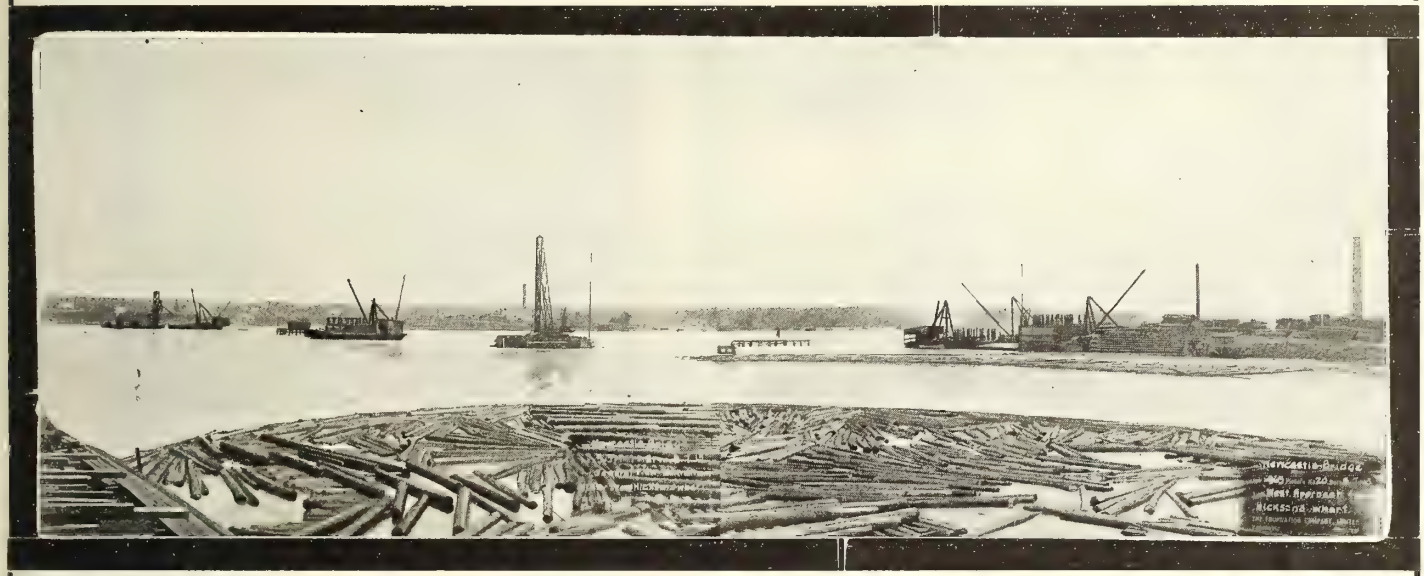
BRIDGE FOUNDATIONS



NEWCASTLE BRIDGE
OVER THE MIRAMICHI RIVER, N.B.

At a point where the Miramichi River is approximately 1400 feet wide, varying in depth from 35 to 45 feet, it was decided to build this new highway bridge.

Borings showed some 25 feet of soft silt overlying strata of clay mixed with sand and gravel extending to considerable depths.

Five caissons are to be sunk to depths varying from 45 to 55 feet below water level, where firm clay is reached, piles then being driven and cut off at this depth and concrete deposited.

The above shows our forces at work on the construction of the five piers and two abutments.

STANDARD FIRE-PROOF DOORS

INSPECTED AND LABELLED UNDER THE DIRECTION OF THE UNDERWRITERS LABORATORIES (INC.)
SHEET METAL WORKERS, SKYLIGHTS, CORNICES AND WINDOWS.
LET US ESTIMATE ON YOUR NEXT REQUIREMENTS.

ALL OUR DOORS AND HARDWARE ARE LABELLED BY THE UNDERWRITERS.

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Phone Adelaide 2377 528 FRONT STREET WEST, TORONTO

Wrought
Iron
Door
Grills

Kick Plates
Push Plates

We make all sorts of work in wrought iron, brass and bronze, for the protection and decoration of the exterior and interior of buildings.

CATALOGUE ON REQUEST

Dennis Wire & Iron Works Co.
London, Ont. Limited
Toronto Branch : 36 LOMBARD STREET

Dominion Marble Company
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SOLE producers of the Beautiful Royal Dominion marble quarried at South Stukely, Que. A card or 'phone call will bring our representative to submit figures on any class of marble work. Address all letters to the Company P.O. Box 1166, Montreal.

ALEX. BRUCE & CO.
Timber Preservers and Fireproofers
Fort Frances, Ont.

Sole owners of the B. M. patent process of lumber preserving.
British Method Best Method

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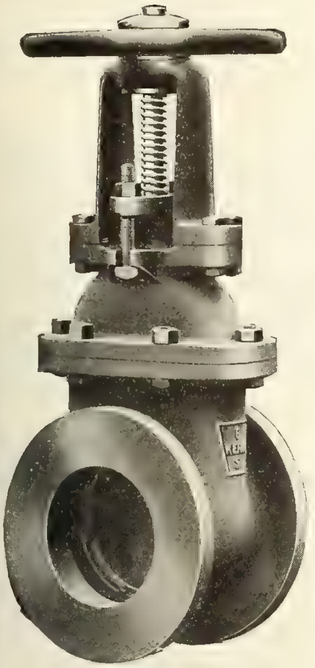
Hotchkiss Steel Forms

For walks—curbs—curb and gutter combined—driveways, roads, pavements, etc.
The benefit of 20 years experience as successful contractors.

Yours for the Asking

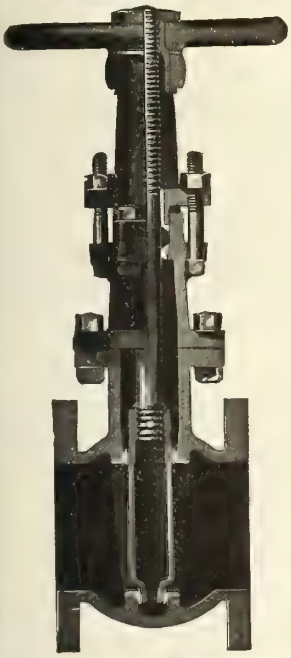
Hotchkiss Lock Metal Form Co.
BINGHAMPTON, N.Y.



The KERR "Keystone"

Iron Body GATE VALVES

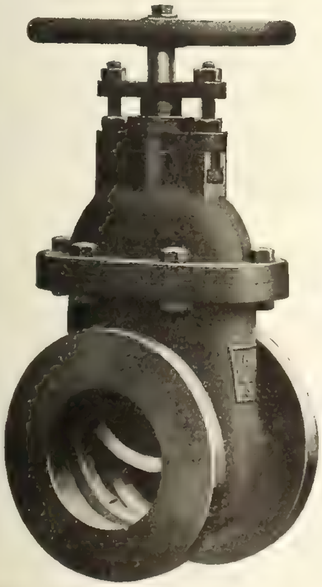
are not surpassed by any other gate valve in **Design, Quality** of material, **Durability, Workmanship,** and up-to-the-minute requirements.



They have been designed and are built to meet the specifications of the most exacting and critical Engineers, and will bear the rigid scrutiny of "THE MAN WHO KNOWS."

If you are particular about the valves you specify or buy, you will not only **specify, but demand Kerr (Keystone) Iron Body Gate Valves.**

Any **Kerr Valve** lends class and distinction to any steam or water job.



Manufactured and Guaranteed by

The
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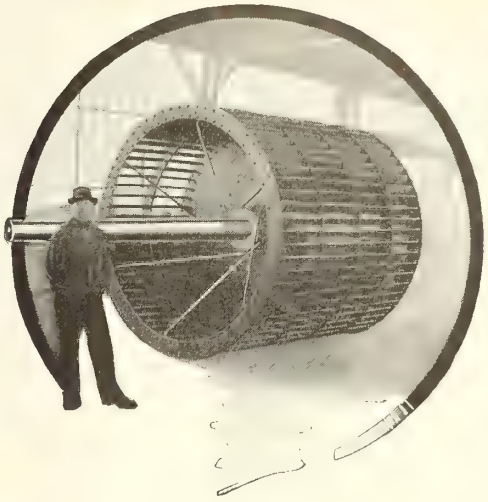
Engine Company
Limited
WALKERVILLE, ONT.

VALVES
and HYDRANTS
exclusive output.



Fresh Air for 9,000 People Delivered by ONE

"Sirocco"

TRADE MARK.

Ventilating Fan

The illustration shows a double inlet "Sirocco" Fan with a capacity of 270,000 cubic feet of air every 60 seconds at 5" water gauge.

A "Sirocco" Fan will deliver twice as much air as the ordinary steel plate fan of the same wheel diameter. Save one-half the space and one-third the power.

"Sirocco" Fans and Blowers are made in sizes to deliver from 75 cubic feet per minute to 1,000,000 cubic feet per minute.

Our Engineering Department will gladly co-operate with you in the selection of the proper equipment for YOUR needs.

Let us tender on your next requirements. Bulletin No. 3401 is descriptive of the construction and operation of "Sirocco" Fans. You should have a copy.

CANADIAN Sirocco COMPANY
LIMITED
WINDSOR. ONTARIO.

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E. C. POWERS, Room 5, 43 Victoria St., Toronto
W. P. EDDY, 214 Donald St., Winnipeg
S. S. Clarke, 605 2nd St. West, Calgary

Current Prices of Building Material

BRICKS

The following are wholesale prices delivered at Toronto:—

	Per M
No. 1 dry pressed red brick	$18 00
No. 1 dry pressed buff brick	18 00
Red Stock Bricks	13 00
Grey Stock Bricks	13 00
Wire cut bricks for foundation work	12 50
Porous terra cotta bricks	15 00
No. 1 enamelled bricks, all colors, from	$80 00 to $150 00
Sand-Lime Bricks	11 00

LUMBER (Building Material)

Hemlock Lumber—

2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$26 00	
2 x 4 to 2 x 12, 16 ft.	26 00	
2 x 4 to 2 x 12, 18 ft.	29 00	
1 in. Hemlock, No. 1	25 00	27 00
No. 1 Hemlock Decking	25 00	27 00
No. 2 Hemlock dimension and 1-in.	19 00	21 00

Pine—

1 in. common pine 8 to 12 in. wide rough	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
⅞ x 8 and 10 in. pine shelving	36 00	42 00
⅞ x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine desking D2S	30 00	
Spruce Decking	28 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

Pine trim for paint finish—

4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8-in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

Shingles—

XXX B. C. Clear Shingles per M.	3 90
N. B. Extras	3 75
N. B. Clears	3 10
No. 1 pine lath, per M.	5 00
No. 2 pine lath	4 50
No. 1 spruce lath	4 00

Cedar Posts—Fence—

5 in. at small end, each	30
7 in. at small end, each	35
Hemlock lath	3 50

Dimension Timber up to 32 feet:

8x8, 10x10, 10x12, 12x12, 12x14	32 00
8x10, 8x12, 10x14, 14x14	34 50
8x14, 12x16, 14x16, 16x16	34 50
10x16, 14x18, 16x18	35 50
8x16, 12x18, 18x18	36 00
10x18, 14x20, 16x20	36 50
8x18, 12x20, 18x20	37 00
10x20	37 50
8x20, 14x22, 16x22, 18x22, 20x22, 22x22	38 50
12x22	39 00
10x22	39 50
8x22, 14x24, 18x24, 20x24, 22x24, 24x24	40 50
12x24	41 00
10x24	41 50
8x24	43 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

	Star	D.D.
10 to 25 united inches	$4 25	$ 6 25
26 to 40 "	4 60	6 75
41 to 50 "	5 10	7 50
51 to 60 "	5 35	8 50
61 to 70 "	5 75	9 75
71 to 80 "	6 25	11 00
81 to 85 "	7 00	12 50
86 to 90 "		15 00
91 to 95 "		17 50
96 to 100 "		20 50
101 to 105 "		24 00
106 to 110 "		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for box lots:—

MONTREAL

	Star	D.D.
25	$3 40	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
90		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 u.i.	$3 50	$5 00
26/40	3 75	5 50
41/50	4 25	6 25
51/60	4 75	7 00
61/70		8 00
71/80		9 00
81/85		10 00
86/90		11 00
91/95		13 00
96/100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

STEAM FITTERS' AND PLUMBERS' SUPPLIES

Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock ...... net $1.85

No. 4½ Fuller's .... net $2.50

Square head brass cocks, 65 per cent.

Lead Pipe

Lead pipe, $7.50, less 5 per cent.; lead waste, $9.00, less 5 per cent.; caulking lead, 7 cents per lb.; traps and bends, 40 per cent.; pig lead, 5¾ cents per lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.28	¼ inch	$3.18
⅜ "	2.28	⅜ "	3.18
½ "	2.72	½ "	3.57
¾ "	3.28	¾ "	4.43
1 "	4.85	1 "	6.55
1¼ "	6.56	1¼ "	8.86
1½ "	7.84	1½ "	10.59
2 "	10.55	2 "	14.25
2½ "	16.67	2½ "	22.52
3 "	21.80	3 "	29.45

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

Soil Pipe and Fittings

Medium and extra heavy pipe and fittings, up to 6-inch, 60 and 5 per cent.

7 and 8-inch pipe, 45 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

CEMENT, STONE, STEEL, Etc.

Cement, barrel lots, in bags, delivered Toronto, bags extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ⅜-inch, $1.45.

Burnt River rubble stone delivered, $17 to $18 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¼ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

Free stone delivered, $17 to $18 per toise.

Brown coursing stone, delivered, $3.75 per yard.

Grey coursing stone, delivered, $2.50 to $2.75 per yard.

Sand, for cement or brick work, $1.15 a cubic yard, f.o.b. Toronto, C. P. R. sidings.

Sand, for cement or brick work, 90c to $1.05 a cubic yard, f.o.b. Toronto, G. T. R. sidings.

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

Steel channels and beams, angles and plates, $2.65 to $3.00 per 100 pounds, delivered f.o.b. Toronto.

Hard Wall Plaster, unsanded, from $7.00 to $8.50, bags extra; sanded, $4.00 in car lots; hydrated lime, $10.00 in car lots.

Lime per cwt., delivered, not less than 1,500 lbs. 33 cents; white, 43 cents.

Plaster of Paris, Anchor and Crown Brands, $1.50.

Manilla Rope, best, per pound, 12½ cents.

PAINT AND OILS

Pure White Lead, ground in oil, $9.00 per 100 lbs.

Boiled Linseed Oil in bbls., 67c per gal of 9 lbs.

Raw Linseed Oil, in bbls., 64c per gallon.

Turpentine, in barrels, 60c per gallon.

Pure Red Lead, dry $7.00 to $8.00 per 100 lbs.

Putty, pure linseed oil, in bulk, bbls., 3½c.

Putty, pure linseed oil, in 25-lb. tins, 4c.

Gravity System Distributing Concrete

Gravity System Equipment on Large Concrete Building

A system that improves the concrete and reduces the cost.

Information gladly furnished and estimates given on any work.

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Stinson Reeb Builders' Supply Co., Ltd.
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☛ Erected at Seven Falls, Quebec, Distributor Pipe and Branches, under 450 ft. Head.

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is our specialty, We fabricate and erect from your drawings, or will design your structure for you.

No Work Too Large for us to handle in the minimum of time. May we estimate on your requirements?

WALSH PLATE & STRUCTURAL WORKS, LIMITED

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and Turned

Bedford Stone

Quarries and Mills

near Clear Creek, Indiana

Chicago Mill and Storage Yard:
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Representative, Toronto, Canada,
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Mill Blocks
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CHICAGO, ILL.

Quarries and Mills { Bedford, Ind.
Bloomington, Ind.

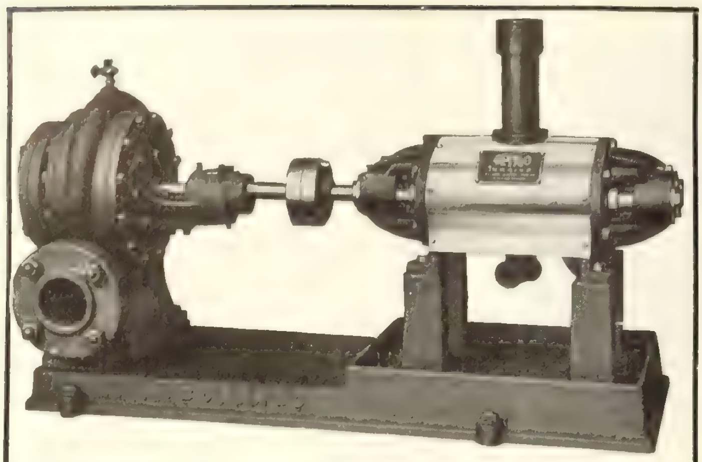
THE H. & E. PATENT BALL-BEARING LIFTING JACKS

For Railway and Bridge Work, Contractors' and Builders' Use

Made by practical Jack Builders. Material: best grades of malleable iron and steel Fully guaranteed as to durability and efficiency. The long even stroke of the lever together with the design and careful construction of the jack, makes it the quickest and easiest working lifting appliance on the market. Made in plain and foot-lift styles. Adapted to all classes of work where a lifting jack can be used. Sizes from 8 to 50 tons capacity now complete. Send for prices and discounts.

To any responsible Firm or Railway in Canada any of these jacks will be sent on 30 days trial.

MANUFACTURED BY
Canada Lifting Jack Co., Ltd.
(Formerly the H. & E. Lifting Jack Co.)
Waterville, Que.
Stock carried by F. H. Hopkins & Company, Montreal



The new factor in Pumping Cost.

The remarkable performance of the Spiro turbine as applied to centrifugal pump drive, merely proves the old truth about the cardinal virtue of simplicity.

A gas producer yields a horsepower from the smallest quantity of coal, yet a steam operated Spiro-Centrifugal pumps a gallon of water at a much smaller total cost, figuring attendance, depreciation, investment and fuel combined.

Over and above this, the Spiro-Centrifugal has set up a new standard in continuity of operation, and by its almost total absence of repair cost.

"Buffalo" SPIRO-CENTRIFUGAL PUMPS

No one dreamed that a pair of plain herring-bone gears could be made into an engine or turbine before the advent of the Spiro. This new principle is revolutionary and has reduced prime mover construction to what would seem the limit of simplicity, service and economy combined. Not a single blade, nozzle or valve in the entire unit. Just a pair of herring-bone gears enclosed in a cylinder, with a jet of steam blown against them.

Ask for new 84-page catalog No. 225, and investigate the wonderful adaptability of the Spiro for direct connection to Pumps, Fans, Generators and machinery used in mining, quarrying and other pursuits.

Buffalo Steam Pump Co.

Sole Canadian Agents—

CANADIAN BUFFALO FORGE CO.
Limited
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Structural Water-proofing

"DEHYDRATINE"
For Water-proofing under the membranous method.

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For Water-proofing Concrete.

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For Surface Hardening Concrete Floors.

"SYMENTREX"
A Cement Coating—Makes Surfaces Water Shedding.
MADE IN COLORS

"These Trade Names protect you against the possible selection of inferior materials. Whether you prefer a water-proof paint or a compound, we can give you satisfactory assurance as to the reliability of these products."

"FOR 15 YEARS STANDARD OF THEIR KIND."

Pinchin-Johnson & Co.
(Canada) Limited
Minerva House, - Toronto
Write for Particulars and Architect's Hand Book (1913 edition)

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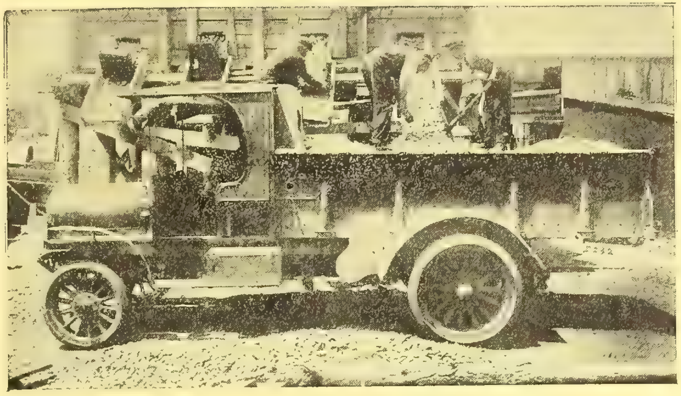
MACK

Think of a Truck Saving $43 a Day Over Horses!



A seven-ton Mack Truck doing the work of eight mule teams in the constructiou of macadam road.

The City of Rutland, Vermont, owns a seven-ton Mack Dumping Truck, of which Mayor Clement writes as follows:—

"We moved on an average of 114 tons a day with this truck at a daily cost of $5. If this same work were done by teams it would require at least 12 teams costing, in this city, $4 each."

As it cost them only $5 a day to operate the Mack Truck this makes a saving of $43 a day over horses, and yet this is nothing extraordinary.

We have records of hundreds of Mack Trucks earning from $30 to $50 per day. Those who are not getting this result have not adjusted their business conditions to fit the motor truck unit.

An investment in motor trucks can be utilized twenty hours per day if desired, can double up in rush seasons, and does not deteriorate or wear out when idle.

The opportunities for utilizing the motor truck in contracting work are many and varied.

Would you like to know what motor trucks have done for other engineers and contractors? We have the data for you.

The Canadian Fairbanks-Morse Co., Limited

St. John, N.B. Quebec Montreal Ottawa Toronto Winnipeg Saskatoon Calgary Vancouver

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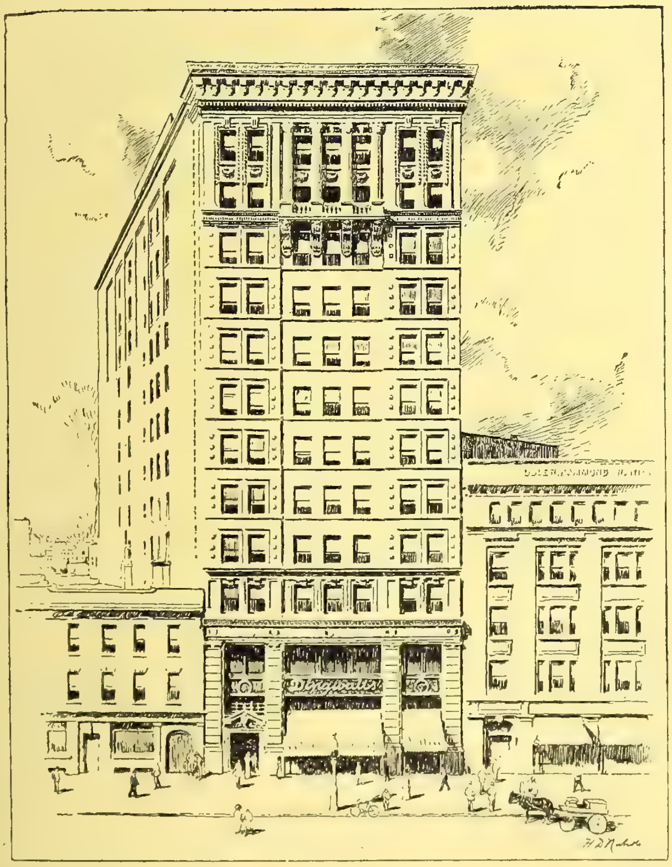


Across Canada with the

Imperial Wire & Cable Company, Limited

Toronto MONTREAL Winnipeg

Third of a series of advertisements showing buildings of national importance which have been wired with Imperial Wire and Cable Co's. Limited, wires.

This picture shows

THE McARTHUR BUILDING, WINNIPEG

This building was wired with "30% PARA" Rubber Insulated Wire.

Architect; J. H. G. Russell, Winnipeg
Engineer; Charles L. Pillsbury, Minneapolis, Minn.
Electrical Contractors; Mitchell-Gray, Electric Co., Winnipeg.

Address enquiries to nearest office

MONTREAL TORONTO WINNIPEG

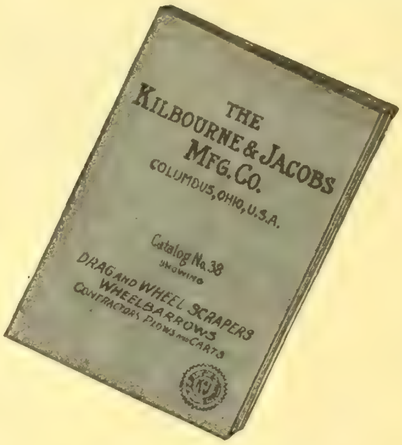
Enquiries from Alberta and British Columbia may be addressed to Northern Electric & Manufacturing Co., Ltd. Calgary and Vancouver.

"ADANAC" "IMPERIAL HIGRADE" and "30% PARA"

A Catalogue—

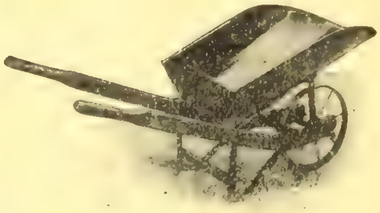
Every Builder and Contractor should have.

Have you received your copy of K. & J. Catalogue No. 38?



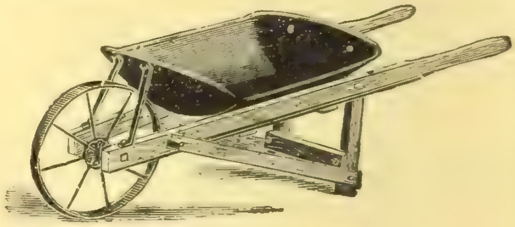
Have you received your copy of K. & J. Catalogue No. 38?

This New No. 38 Kilbourne & Jacobs' Catalogue illustrates and describes fully every style of barrow, wheel or drag scraper and plows. You may require equipment of this description—perhaps not at the moment but later on. This book will surely be of assistance to you as you can select the proper style of barrow, etc., for your requirements. Let us send you a copy—free for the asking.

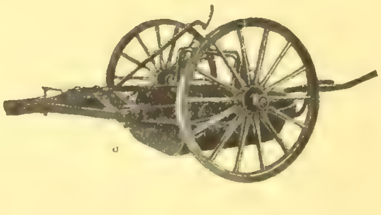


"Kilbourne & Jacobs" Wheel Barrows

All styles in stock



Wheel and Drag Scrapers



F. H. Hopkins & Co.

MONTREAL

BRANCH OFFICES: General Supply Company of Canada, Ltd., Winnipeg Agents
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Vol. 27 Toronto, September 10, 1913 No. 37

ESTABLISHED 1886

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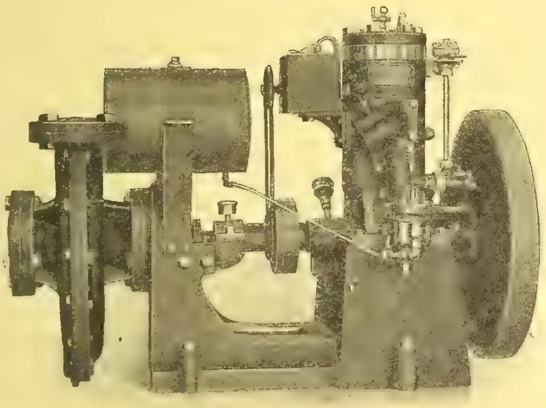

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HAMILTON, CANADA

"MADE IN CANADA"

Bent Glass

Made in all Kinds of Glass on Short Notice

Large Bent Plate Glass for Shop Fronts a Specialty

The Toronto Plate Glass Importing Company, Limited
(HILL & RUTHERFORD, Managing Directors)
Head Office and Works: 91 to 133 Don Roadway
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Air Compressors
OF BELLISS MAKE
have gained their reputation for

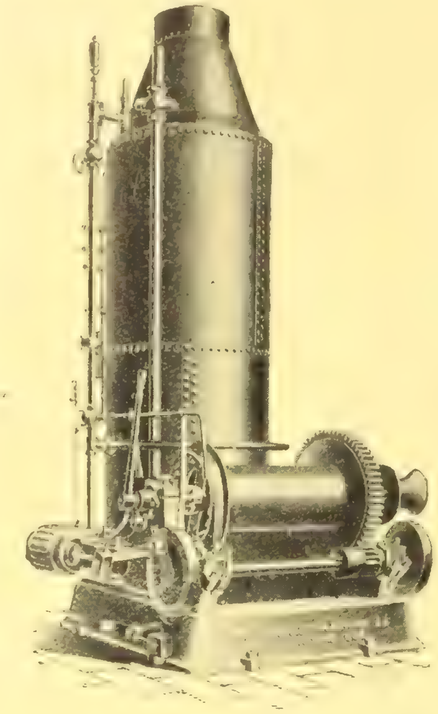
Simplicity of Design
Noiseless Running
Compact Design
Low Oil Consumption
Continuous Operation
Overall Efficiency

Messrs. Belliss & Morcom, Ltd.
BIRMINGHAM, ENGLAND
Agents
Laurie & Lamb
Board of Trade Building, MONTREAL

Continuous and Machine Banded Wood Stave
WATER PIPE
RESERVOIR TANKS
for city and town Water Systems, Fire Protection, Power Plants, Hydraulic Mining, Irrigation, etc. One-half the cost of Iron Pipe—and better.

Pacific Coast Pipe Co., Limited
P. O. Box 563 Vancouver, B. C.
Office and Factory, Granville St., near High Bridge
WRITE FOR CATALOGUE
Full Particulars and Estimates Furnished

Alphabetical Index of Advertisers, Page 16 Classified Directory to Advertisements, Page 6



Hoisting Engines

¶ To the Contractor who wants a good reliable and efficient hoisting engine,—one that will always be right on the job—we suggest an inquiry into our wide range of this type of machine.

Any one of our offices will help you find the engine best suited to your needs.

The JENCKES MACHINE COMPANY, Limited
General Offices: SHERBROOKE, QUE.
WORKS: SHERBROOKE, QUE. ST. CATHARINES, ONT.
Sales Offices: Sherbrooke, St. Catharines, Nelson, B.C., Vancouver, Montreal, Cobalt, S. Porcupine

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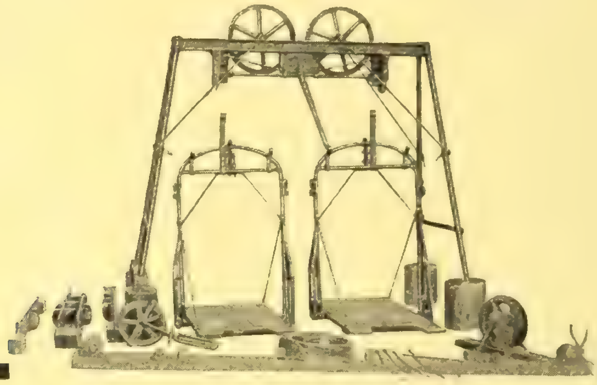


THE "AMERICAN" MATERIAL ELEVATOR

Is Strong, Light and Durable

The platforms are of selected, kiln dried oak, the balance of construction is of iron strongly trussed and braced.

The "AMERICAN" Material Elevator runs smoothly and is under absolute control at all times. It is easily set up or taken down for shipping or moving from building to building. It packs into small space, weighing, ropes and all, about 1,200 pounds.

"AMERICAN" material elevators are thoroughly dependable. They help contractors finish their jobs ahead of time.

MADE BY

AMERICAN HOIST & DERRICK COMPANY
ST. PAUL, MINN., U. S. A.

SOLD BY
General Supply Co., of Canada, Ltd. Montreal, Ottawa, Toronto, Canada. Stuart Machinery Co., Winnipeg, Man. Vancouver Machinery Depot Ltd., Vancouver, B.C. Gorman, Clancy & Grindley, Edmonton and Calgary, Alta. and Nelson, B. C.

PERMANENCE

an ideal that is now attainable

THE superiority of concrete over all other materials for the building of permanent structures, is now generally admitted.

The next step towards ideal construction, is to realize that for satisfactory concrete work, it is necessary to use a cement that is uniformly high-grade

CANADA Portland CEMENT

is the selection of the leading engineers, architects and contractors. Their experience has proved that in this brand they can obtain a certainty of success.

With concrete coming into more and more general use for the construction of buildings, bridges, viaducts and highways, it is vitally important that those in authority on such matters should select the best materials obtainable.

Use the cement that our best architects and engineers have selected for their most important undertakings. Select Canada Cement—it costs no more than any other.

Canada Cement Company Limited
Montreal

Sales offices at
Montreal Toronto Winnipeg Calgary

The World's Leading

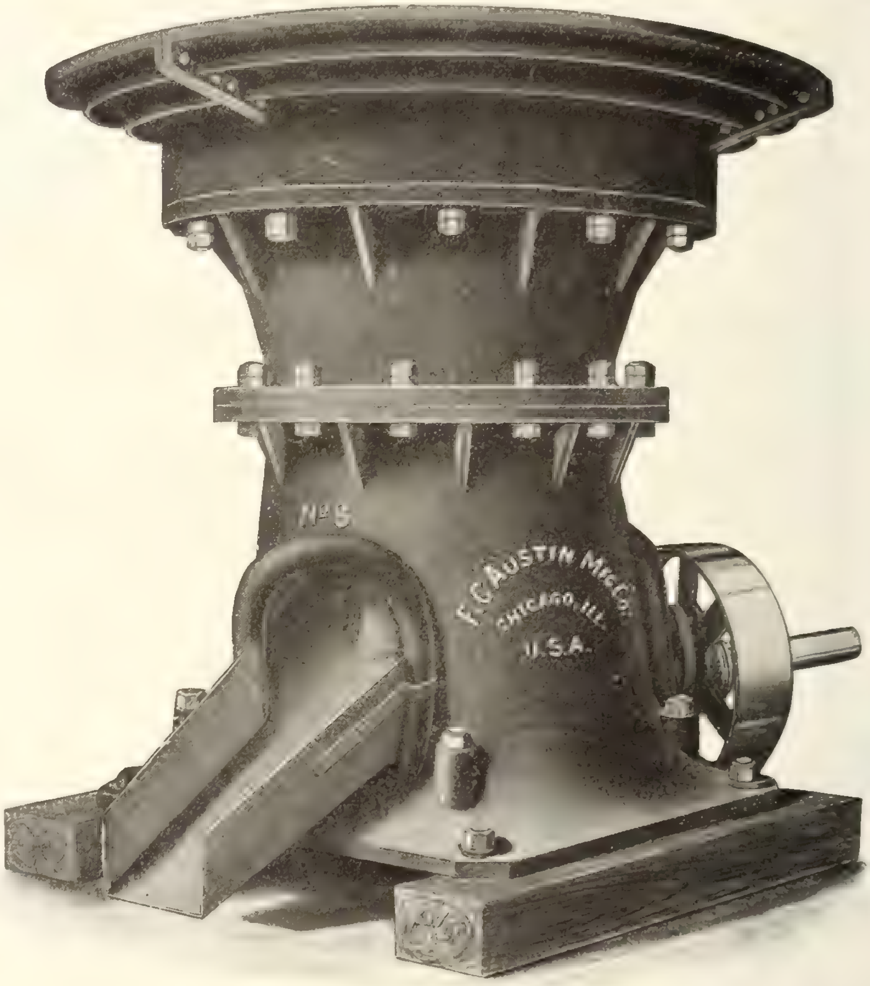
Ore and Rock Crusher

The

Austin Gyratory Crusher

Made in Eight Sizes

Capacities 50 to 5000 Tons per day



Its many superior qualities and mechanical advantages have won the highest reputation amongst mining engineers and quarrymen.

Plans and specifications furnished for any size of plant.

Montreal, 318 St. James St.
Toronto, 155 West Richmond St.
Cobalt, opp. Right of Way Mine.
Winnipeg, 259-261 Stanley St.

MUSSENS

EXCAVATING

Cannot be more economically handled than with a

Bucyrus Revolving Shovel

Sizes
14 B
18 B

Dippers
$^5/_8$ yard
$^7/_8$ yard

They will dig a wider floor than other shovels. They have the maximum radius of action; will dig straight, high cuts, or below grade easily.

The Shovel for cellar excavation, street work, foundation work, sand and gravel pits, ditch and sewer work, etc.

LIMITED

Calgary, 10th Ave. & 3rd St. E.
Vancouver, 365 Water Street
Quebec, 71 Maple Ave.
St. John, N.B., 57 Smythe St.
Halifax, 78 Granville St.

CLASSIFIED INDEX TO ADVERTISEMENTS

The following regulations apply to all advertisers: Eighth page, two headings quarter page, four headings; half page, eight headings; full page, sixteen headings.

Air Compressors
Canadian Allis-Chalmers, Limited.
Canadian Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd.

Architects
Weeks, Arthur L.

Architects' Instruments
Stanley Co., W. F.
W. & L. E. Gurley.

Architectural Iron Work
Canadian Allis-Chalmers, Limited.
Canada Wire & Iron Goods Co.
Dennis Wire & Iron Works.
Dom. Ornamental Iron Works.
Eberhard & Wood
McGregor & McIntyre
Meadows Co., Geo. B.
Steel & Radiation Ltd.

Architectural Metal Work
Feather & Roadhouse.
Ormsby Co., Limited, A. B.
Metal Shingle & Siding Co.
Metallic Roofing Co.

Architectural Terra Cotta
Black Building Supply Co., Ltd.
Don Valley Brick Works.
Gibbs & Canning.
Northwestern Terra-Cotta Co.
Toronto Plate Glass Imp't'g Co.

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Asphalt & Supply Co.
Baker, John Jr.
Barber Asphalt Paving Co.
Canadian Mineral Rubber Co.

Belting
Can. Consolidated Rubber Co.
Goodyear Tire & Rubber Co.
Can. Fairbanks-Morse Co.
Dominion Belting Co.

Blowers
Canadian Buffalo Forge Co.
Can. Ingersoll-Rand Co., Ltd.
Canadian Sirocco Co.
Douglas Milligan Co.
Sheldons Limited
Sturtevant Co. of Can. Ltd., B. F

Boilers
Berg Machinery Mfg. Co.
Canadian Allis-Chalmers, Limited.
Boving Company of Canada.
Inglis Co., John.
Jenckes Machine Co.
Leonard & Sons, E.
Marsh & Henthorn.
McDougall Caledonian Iron Wks.
Mussens Limited.
Waterous Engine Works Co.

Boxes—Junction.
Standard Underground Cable Co. of Canada Limited.

Brewers' Machinery
Linde British Refrigeration Co.

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American Enamelled Brick Co.
Black Building Supply Co., Ltd.
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Douglas Milligan Co.
Don Valley Brick Works.
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Nova Scotia Clay Works.
Sydney Pressed Brick Co.

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Heinicke Co., H. R.

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Britnell & Co.
Bremner, Alex.
Canada Cement Co.
McNally & Co., W.
Morrison & Co., T. A.
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Rogers, Alfred Limited
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Abram Cement Tool Co.
Wettlaufer Bros.

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Coal Handling Apparatus
American Hoist & Derrick Co.
Browning Engineering Co.
Brown Hoisting Machinery Co.

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Hutchinson, M.

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Blystone Machinery Co.
Canadian Allis-Chalmers, Limited.
Canadian Concrete Appliance Co.
Hopkins & Co., F. H.
Lecky & Collis.
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Mussens Limited.
Waterloo Cement Machinery Co.
Wettlaufer Bros.
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Concrete Tampers
Canadian Warren Axe Co.

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Can. H. W. Johns-Manville Co.
Conduits Co., Limited.

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Foundation Co.
Reggin & Spence.

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Beatty & Sons, M.
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Canadian Concrete Appliance Co.
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Doty Marine Engine & Boiler Co.
Dore & Fils.
Hamilton Mfg. Co., Wm.
Hepburn & Co., F. H.
Hopkins & Co., F. H.
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Marsh & Henthorn.
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Mussens Limited.
Royce Limited.
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Stinson-Reeb Builders' Supply Co
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Wettlaufer Bros.

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Weller Mfg. Company.

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Can. Ingersoll-Rand Co., Ltd.

Cork Installation Machinery
Linde British Refrigeration Co.

Corrugated Iron
Can. H. W. Johns-Manville Co.
Metallic Roofing Co.
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Browning Engineering Co.
Brown Hoisting Machinery Co.
International Marine Signal Co.
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Cabot, Inc., Samuel.

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Rogers Supply Co.
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Smyth & Ryan.

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Hamilton Mfg. Co., Wm.
Hopkins & Co., F. H.
Jenckes Machine Co.
Lecky & Collis
London Concrete Machinery Co.
Mussens Limited.
Wettlaufer Bros.

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Hepburn, John T.

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Browning Engineering Co.

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Star Expansion Bolt Co.

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Canadian Ingersoll-Rand Co.

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Ferranti Electrical Co.

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Laurie & Lamb.
Leonard & Sons, E.
McDougall Caledonian Iron Wks.
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Sturtevant Co. of Can. Ltd., B. F
Waterous Engine Works Co.
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Chipman & Power.
Farmer, John T.
Galt Engineering Co., John
Lea & Ferguson.
Mitchell, C. H.
Thorold Co., F. W.

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Expanded Metal
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Sheldons Limited.
Sturtevant Co. of Can. Ltd. B. F.

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Gurley, W. & L. E.

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Canadian Mineral Rubber Co.

Filters
American Water Softener Co.

Fire Brick
Improved Equipment Co.
Ontario Lime Co., Ltd.
Smyth & Ryan.

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McGregor & McIntyre

Fireproof Doors and Windows
Feather & Roadhouse.
Metal Shingle & Siding Co.
Mussens Limited.
Ormsby Co., Limited, A. B.
Steel & Radiation Ltd.

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Consumers Gas Co.

Fuse (Safety Blasting)
Lecky & Collis.

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Canadian Buffalo Forge Co.
Sheldons Limited.
Canadian Sirocco Co.

Furnaces (Special)
Improved Equipment Co.

Gasoline Engines
Wettlaufer Bros.

Gas Plants Complete
Improved Equipment Co.

Gas Producers for Heating
Improved Equipment Co.

Gas Machinery
Improved Equipment Co.

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Toronto Plate Glass Imp't'g. Co

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Canadian Sirocco Co.
Sheldons Limited

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Escher Wyss & Co.
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Beatty & Sons, M.
Browning Engineering Co.
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C. H. & E. Mfg. Co.
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Canadian Ingersoll-Rand Co.
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Lecky & Collis.
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Mussens Limited.
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Dietrich Limited.

Hoisting Engines
Canadian Allis-Chalmers, Limited.
Canadian Fairbanks-Morse Co.
Wettlaufer Bros.

Hydrants
Canada Iron Corporation.
Gartshore-Thomson Pipe Co.
Kerr Engine Co.

(Continued on page 12)

DON VALLEY

Imperial Bank, Roncesvalles Ave. and Queen St., Toronto

THE Don Valley Buff Oriental Bricks are particularly well suited for bank and pubic buildings. They are burned to give a variety of flashes which lend a soft and pleasing effect to any building.

For Toronto's General Hospital over twenty million of these brick were used.

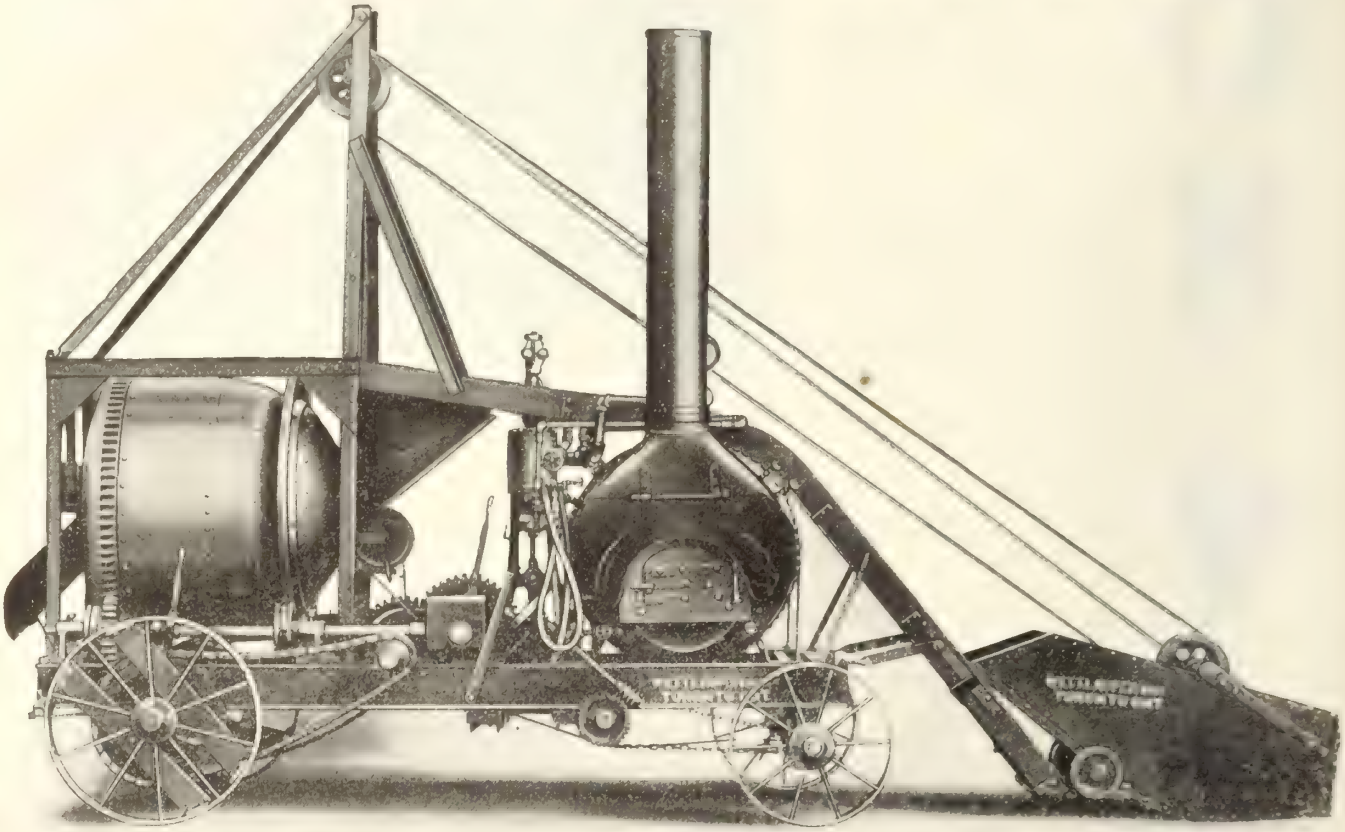
The decorative possibilities of Don Valley Bricks are without number and that they add distinction and attractiveness to a building is acknowledged.

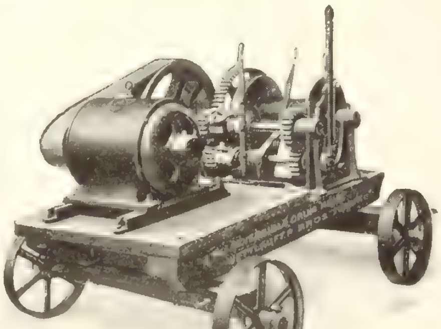
Specify Don Valley Bricks

Don Valley Brick Works

Toronto, Ont.

Wettlaufer





The new Wettlaufer Improved Stationary Heart Shape Drum Traction Mixer. This mixer has a horizontal tubular boiler which saves fuel. The traction arrangement has but two gear reductions making for easy traction. The load is carried low, lessening the chance of upsetting the machine. The Heart Shape Drum insures thorough mixing. One man operates the entire outfit from one position.

Attend a daily demonstration at any of our branches.

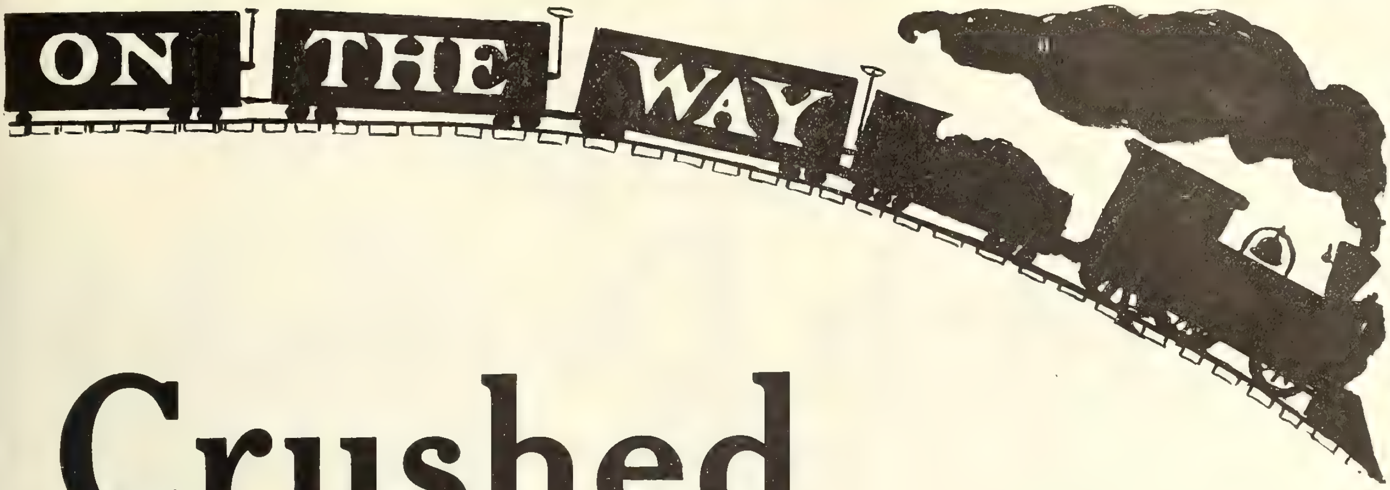
Wettlaufer Bros.

178 Spadina Ave., Toronto, Ont.

Factories: Mitchell, Ont., Buffalo, N. Y., Detroit, Mich.

AGENCIES:

A.E. Hodgert, Regina. Sask. Maysmith & Lowe, 1057 Mears St., Victoria, B.C. A.R. Williams Machinery Co., 15 Dock St., St. John, N.B. The Canadian British Engineering Co., Ltd., 324 Smith St., Winnipeg, Man. R.F. Mancill, 117 10 Ave. East, Calgary. The Hallman Machinery Co., 374 Alexander St., Vancouver, B.C. J. L. Lachance, Ltd., 363 St. Paul St., Quebec. Wettlaufer Bros. 316 Lagauchetiere St. W., Montreal



Crushed Stone

If you want crushed stone in a big hurry come to us and you will get it.

Our bins are always loaded to the top with stone of all grades and shipments can be made the day your order is received.

Quarries located at Dundas and Vinemount.

Portland Cement

Our several cement mills are located at various points that enable us to make prompt shipments with short hauls.

Send us your next order.

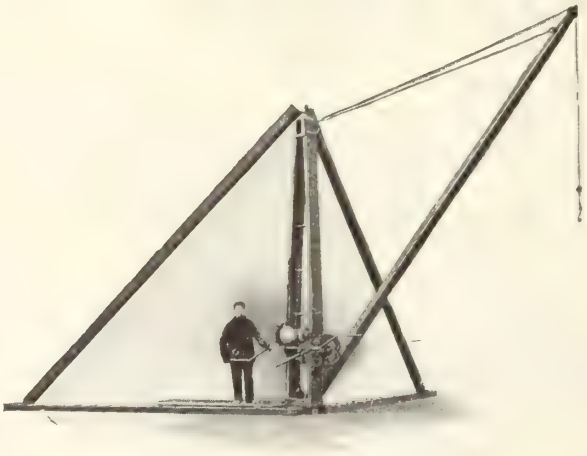
Alfred Rogers

Limited

28 King St. West, Toronto

Beath Scotch Derricks

Hand or Power



THE construction of Beath Scotch Derricks embodies several points of merit not found in other makes.

All stress parts are **steel** not cast iron. Bottom Pintle Bearing is of ball and socket type and works in a bath of oil, thus ensuring an easy movement at this joint.

Beath Derricks are provided with self-oiling bearings, ensuring easy operation and reducing wear to a minimum.

We also make Jinniwink Derricks, Stiff Leg Derricks, Guy Derricks, and Steel Derricks for heavy service. Hand or Power operated.

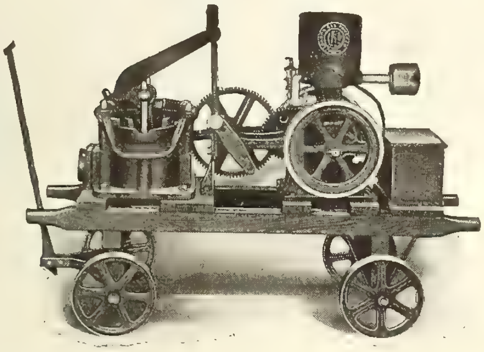
Send us your enquiries for Derricks

W. D. Beath & Son, Limited
ENGINEERS AND MANUFACTURERS
20-30 Cooper Ave., Toronto

The A. M. Ellicott Co., 301 St. James St., Montreal, Que., sole selling agents for Province of Que.

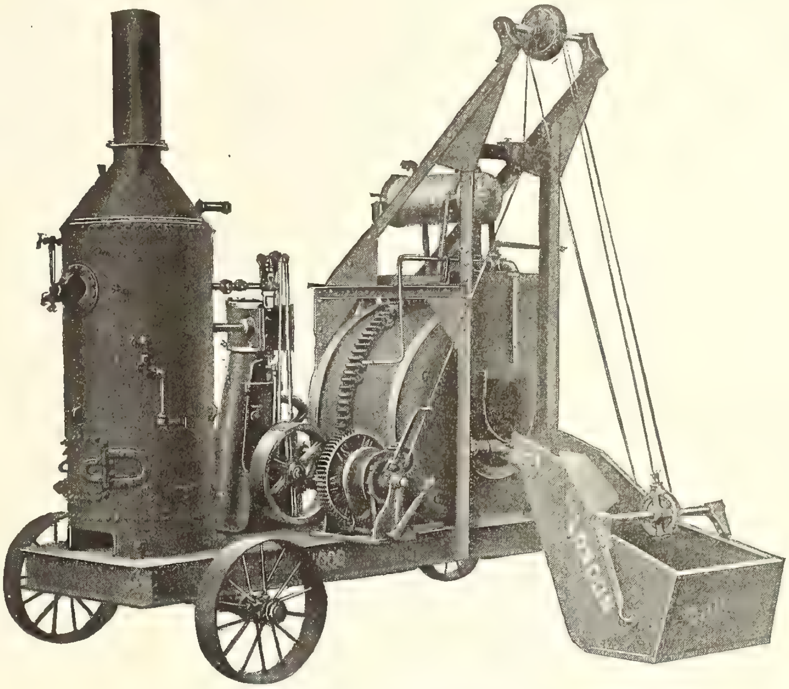
Before You Buy Concrete Machinery

or Equipment of any kind, write us for our 180 page catalogue.



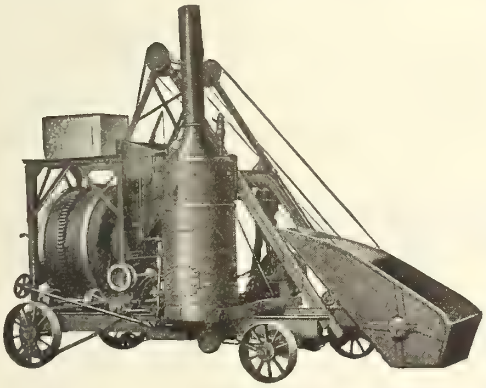
Power Diaphram Pump

We are the largest manufacturers of Concrete Machinery in Canada.



London Standard Drum Batch Mixer

This machine is built in five sizes, fitted with any kind of power; also with traction drive if required.



Rear Discharge Traction Mixer. This machine is also equipped with Boom.

We do not build machinery down to a price but up to a standard.

London Sill Step and Window Cap Mould

A few lines we manufacture—

Concrete Mixers, Mortar Mixers, Tile Moulds, Drain Tile Machines, Side Walk Tile Machines Cement Block Machines, Cement Brick Machines, Sill Step and Window Cap Moulds, Gasoline Engines, Screens and Elevators Fence Post Moulds, Hoisting Engines, Material Elevators, Concrete Carts, Wheelbarrows, Scrapers, Sidewalk Forms, Pumping Outfits

A complete line of Contractors' Tools.

London Concrete Machinery Co., Limited

Head Office and Factory: Cabell St. and Kitchener Ave., London, Ont.

BRANCHES:
WINNIPEG (445 Main St.) W. H. Rosevear, Mgr. CALGARY (622 9th Ave. W.) P. D. McLaren, Mgr.
TORONTO (60 Richmond St. E.) F. D. Emsley, Mgr.

AGENCIES:
VANCOUVER, B. C. Equipment Co. MOOSE JAW, Sask. Bridge & Iron Co., Ltd. REGINA, H. A. Knight
FORT WILLIAM, Northern Eng. & Supply Co. MONTREAL, Foss & Hill Mach. Co. QUEBEC, A. D. Masson

We are the Largest Manufacturers of Concrete Machinery in Canada.

CLASSIFIED INDEX TO ADVERTISEMENTS—CONTINUED

Ice-making Machinery
Linde British Refrigeration Co.

Insulating Compounds
Standard Underground Cable Co. of Canada, Limited.

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Batts Limited
Canada Office & School Fur. Co.
Rhodes Curry & Co.

Kilns
Canadian Buffalo Forge Co.
Sheldons Limited.
Sturtevant Co. of Can. Ltd., B. F.
Canadian Sirocco Co.
Berg Machinery Mfg. Co.

Lime
Jamieson Lime Co.
Ontario Lime Co., Ltd.

Lime Kilns
Improved Equipment Co.

Locomotives
Buffalo Pitts Co.
Boving Company of Canada.
Canadian Allis-Chalmers, Limited.
Montreal Locomotive Works
F. H. Hopkins Co.
Mussens Limited.

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Dominion Marble Co.
Missisquoi-Lantz Corporation

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Metallic Roofing Co.
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Steel & Radiation Ltd.

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Ferranti Electrical Mfg. Co.
Canadian Allis-Chalmers.

Meters, Water
Hopkins & Co., F. H.
McDougal Caledonian Iron Wks
Neptune Meter Co.

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Hotchkiss Lock Metal Form Co

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Goheen Mfg. Co.
Ottawa Paint Co.

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Goheen Mfg. Co.
Pinchin, Johnson & Co.

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Dominion Creosoting Company.
Ontario Asphalt Block Co.
Paterson Mfg. Co., B.

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Greening Wire Co., B.

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Canadian Allis-Chalmers, Limited.
Canadian Pipe Co.
Dominion Concrete Co.
Dominion Wood Pipe Co.
Gartshore-Thomson Pipe Co.
Munderloh & Co.
National Iron Works.
National Pipe & Foundry Co.
Pacific Coast Pipe Co.
Piggott & Co., Thos.
United States Cast Iron Pipe & Foundry Company.
Walsh Plate & Structural Works

Pile Driving Machinery
American Hoist & Derrick Co.
Browning Engineering Co.
Canadian Ingersoll-Rand Co.
Lecky & Collis.

Pipe Fittings and Flanges
Pittsburgh Valve, Foundry & Construction Company.

Planing Mill Exhausters
Canadian Buffalo Forge Co.
Sheldons Limited.
Canadian Sirocco Co.

Plug Drillers
Canadian Ingersoll-Rand Co.

Plaster
Albert Mfg. Company.
Britnell & Company.
Crown Gypsum Company.
Ontario Lime Co., Ltd.

Plumbing
Dietrich Limited.

Pneumatic Machinery
Canadian Ingersoll-Rand Co.

Portable Saws
C. H. & E. Mfg. Co.
Canadian Fairbanks-Morse Co.

Portable Track
Bechtels Limited

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Inglis Company, John.
Jenckes Machine Company.
Canadian Allis-Chalmers, Limited.
Waterous Engine Works.

Pumps and Pumping Machinery
Beatty & Sons, M.
Boving Company of Canada.
Canadian Allis-Chalmers, Limited.
Canadian Buffalo Forge Co.
Canadian Fairbanks-Morse Co.
Canadian Ingersoll-Rand Co.
Cook, A. D.
Hamilton Mfg. Co., Wm.
Hopkins & Co., F. H.
Inglis & Co., John.
McDougall Caledonian Iron Wks.
Smart-Turner Machine Co.
Waterous Engine Works Co.
Mussens Limited.
Ontario Wind Eng. & Pump Co.
Wettlaufer Bros.

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Canadian Ingersoll-Rand Co.
Improved Equipment Co.
Lecky & Collis.
George Anderson & Co.

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Gartshore, John J.
Hopkins & Co., F. H.
Lecky & Collis.
Mussens Limited.

Refrigeration Machinery
Linde British Refrigeration Co.

Reinforcements, Concrete & Steel
Canada Steel Co., Ltd.
Canada Wire & Iron Goods Co.
Greening Wire Co., B.
Steel Company of Canada.
Steel & Radiation Ltd.
Trussed Concrete Steel Co.
Turner, C. A. P.

Revolving Stone Screens
Greening Wire Co., B.

Road Asphalt
Canadian Mineral Rubber Co.
Barber Asphalt Paving Co.
Asphalt & Supply Co.

Road Machinery
Dore & Fils.
Erie Machine Shops.
Lecky & Collis.
Morrison & Co., T. A.
Mussens Limited.
Waterous Engine Works Co.
Western Wheeled Scraper Co.

Road Oil
Baker, John, Jr.

Road Plows
Shunk Plow Company

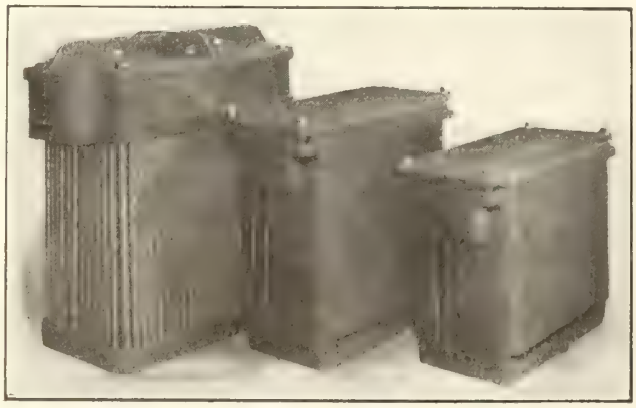
Roofing Material
Asbestos Mfg. Company.
Barber Asphalt Paving Co.
Bird & Son, F. W.
Can. H. W. Johns-Manville Co.
Canadian Mineral Rubber Co.
Metallic Roofing Company.
Noble, Clarence W.
Paterson Mfg. Co.

(Continued on page 14)

Power Logic

Reduced Loss
Increased Profit

Ferranti
Transformers



Three Phase Pole or Station Transformers

The Transmission line that is equipped with Ferranti three phase transformers is always a profitable one because of the great reduction in energy-loss made possible by these efficient transformers.

All coils are wound with copper of ample sectional area, thereby reducing copper losses to a minimum.

Three phase transformers are the most economical type to operate and will effect a considerable saving in construction cost.

Write us for particulars

The Ferranti Electrical Co., of Canada, Limited

TORONTO
90 Sherbourne St.

WINNIPEG
56 Albert St.

Office or Dominion Iron & Steel Co., Ltd,
Built of Sydney Pressed Brick

IN this product you get a brick of such superior quality that a saving of one dollar a thousand can be effected in the laying of the bricks as compared with ordinary irregular brick.

The mortar adheres with great strength to "Sydney" pressed brick and they harden with age.

Prices and Particulars on request.

Sydney Pressed Brick Co.
Limited
Sydney, Nova Scotia

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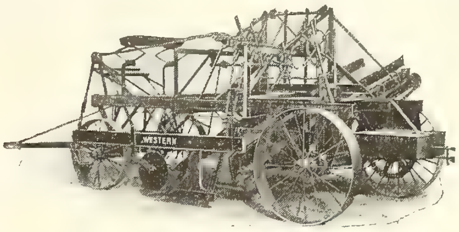

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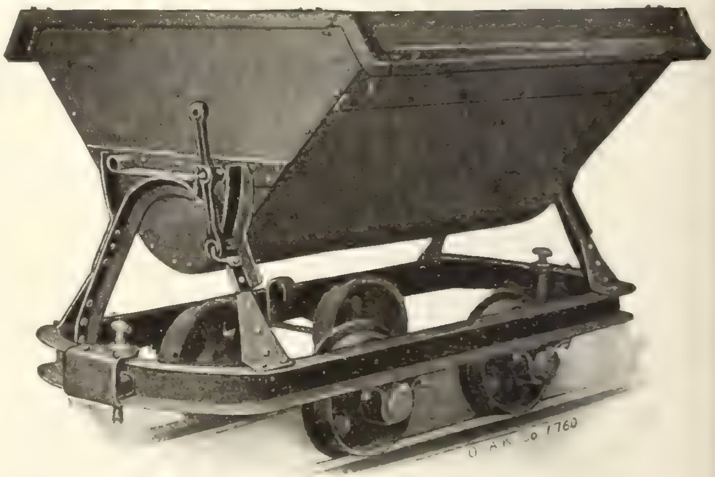

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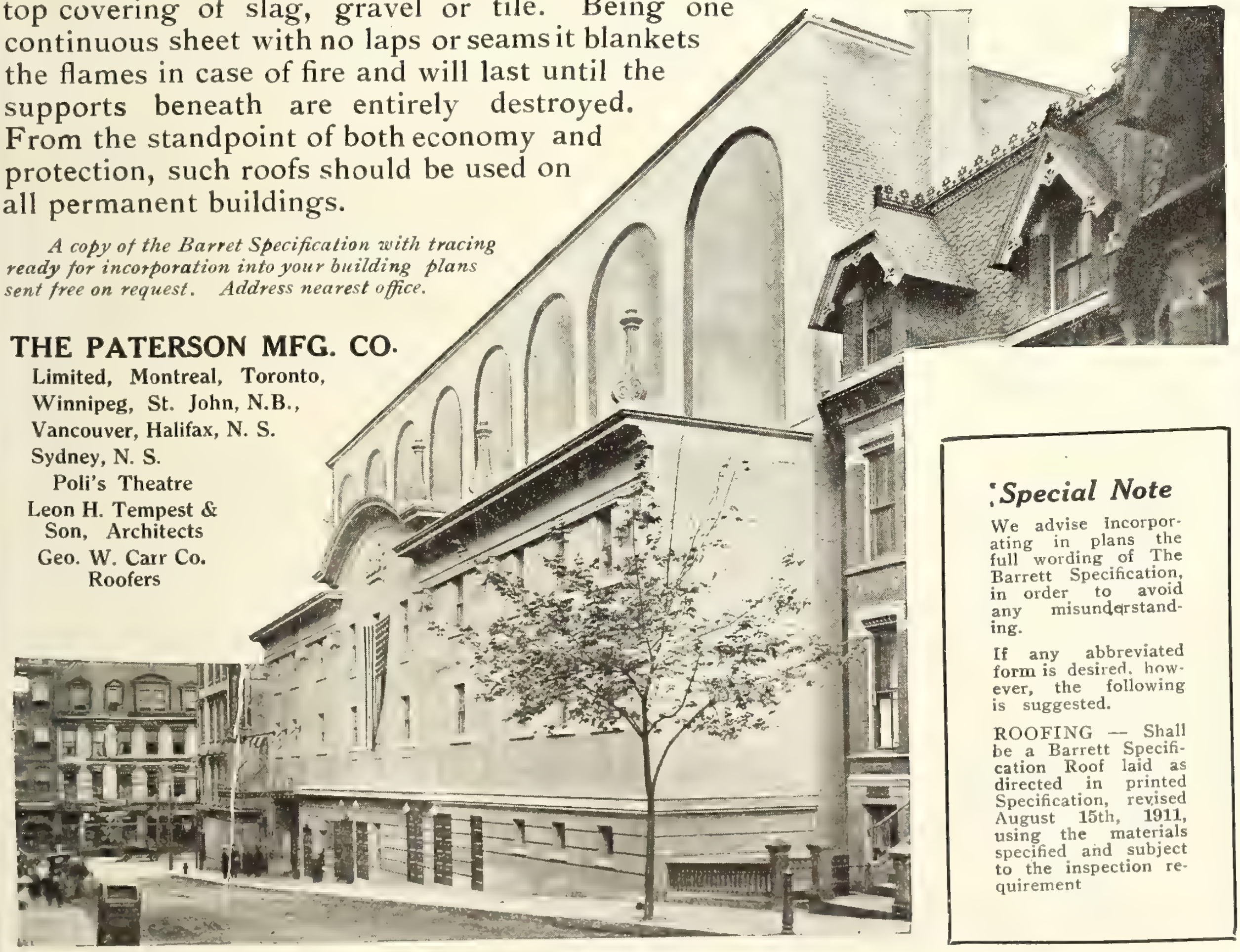

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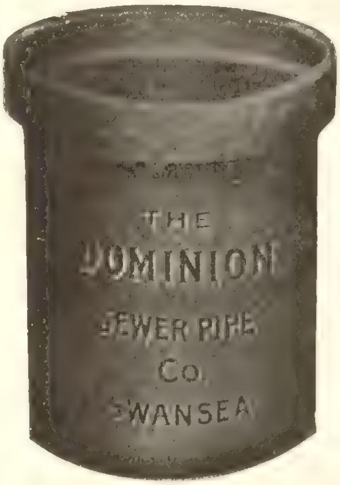

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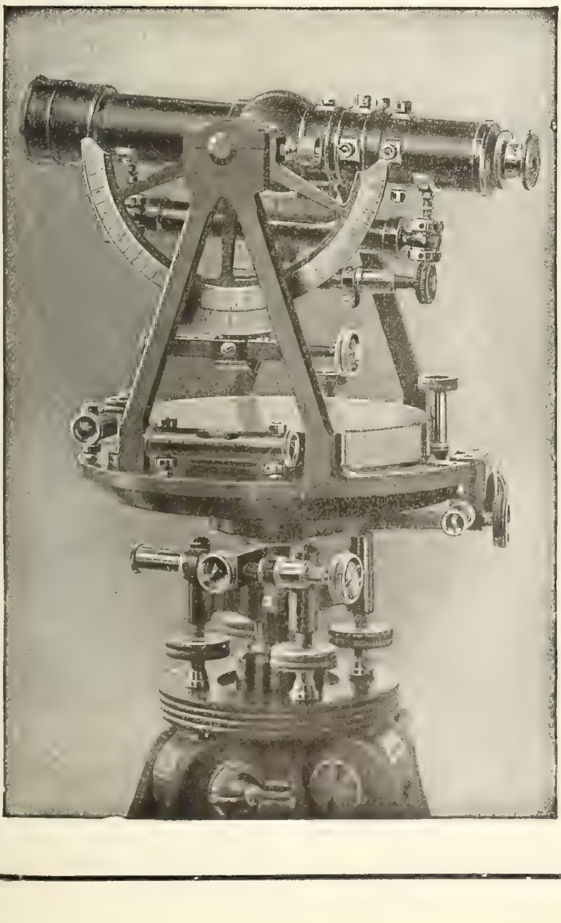

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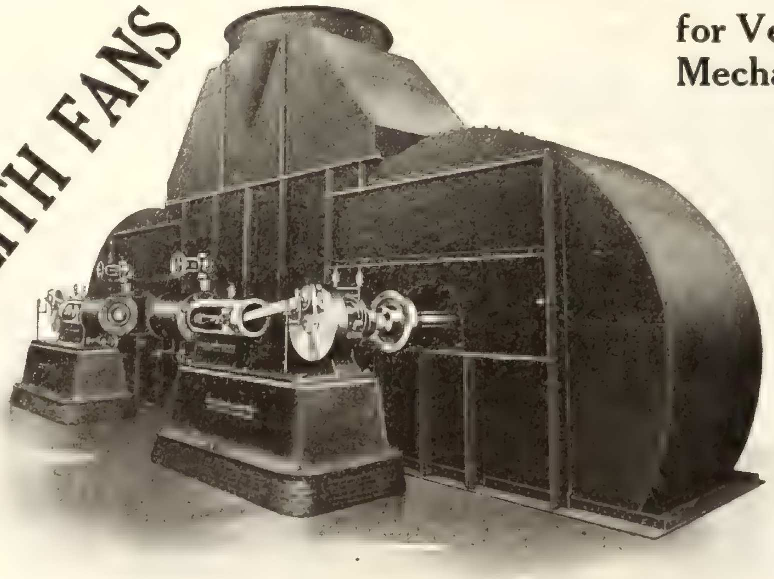

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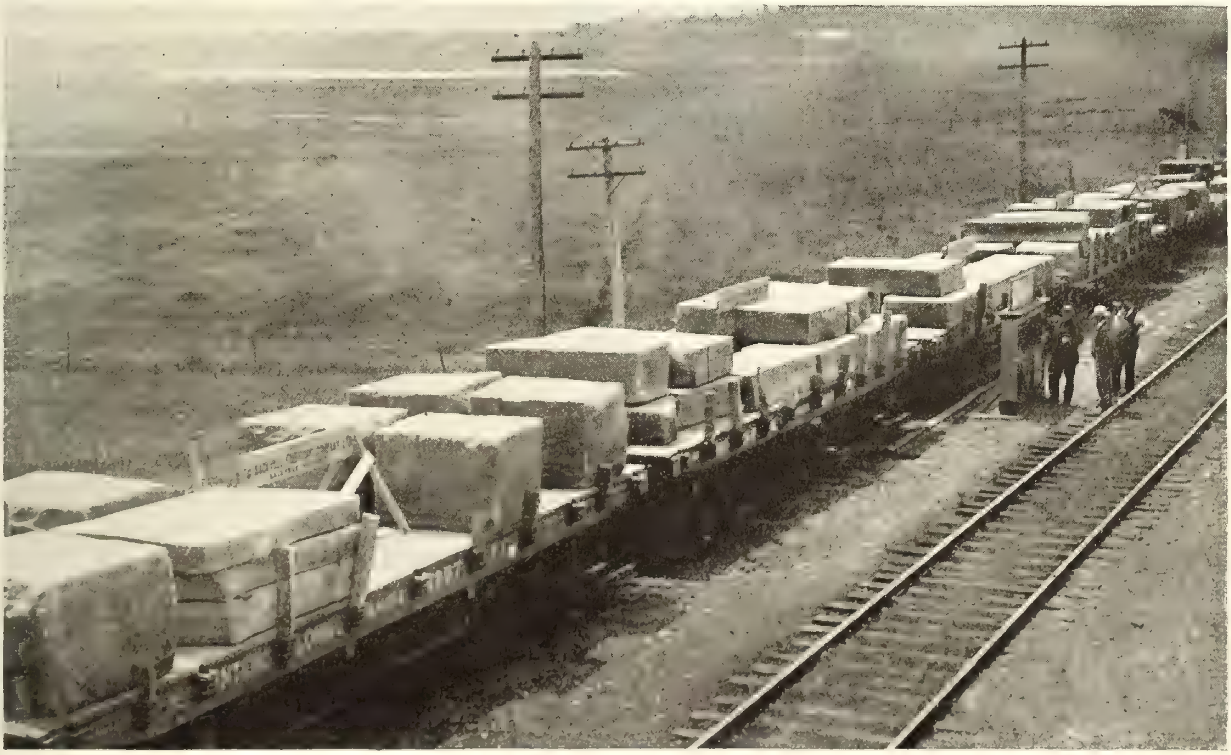

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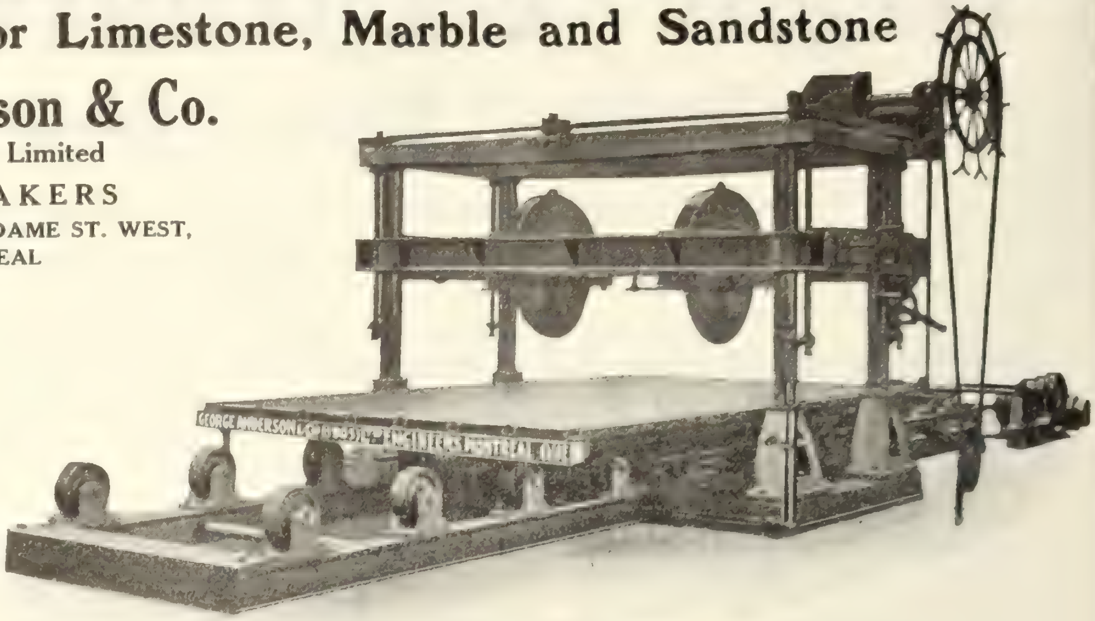

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This morning I saw ten houses under construction, each by a different builder. Each house had cement stucco forming part or all of the outside wall. In every case the stucco was applied on Herringbone Metal Lath. Ten years ago it would have all been on wood lath.

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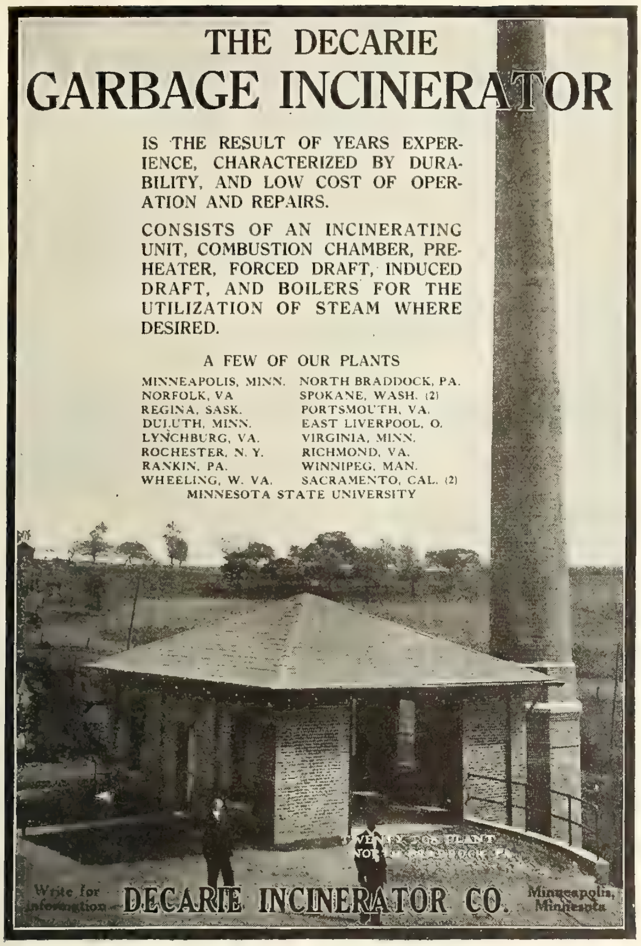

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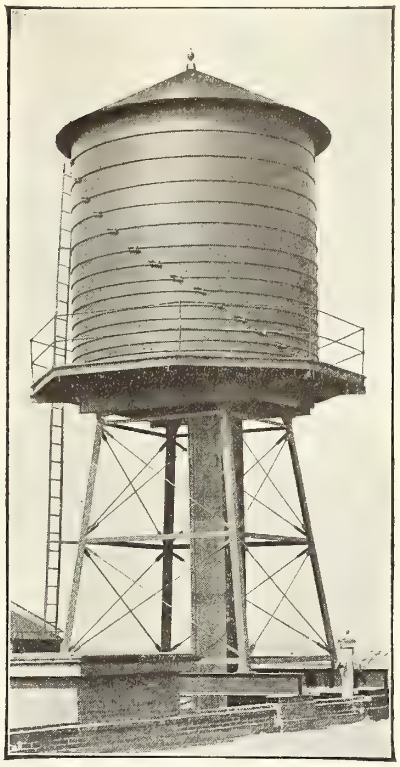

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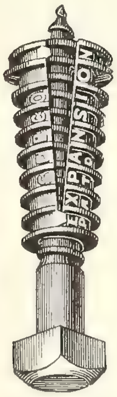

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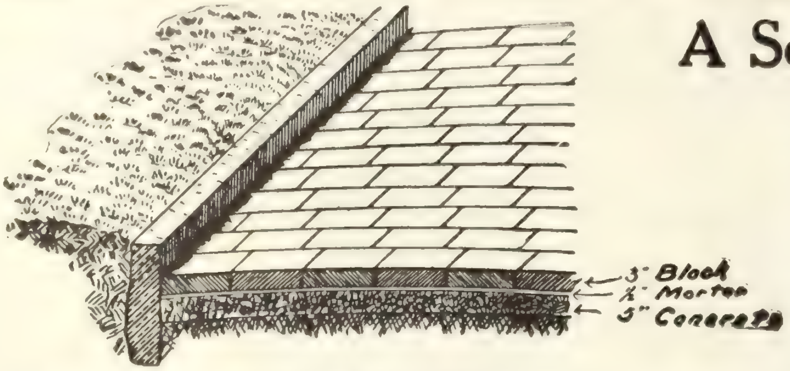

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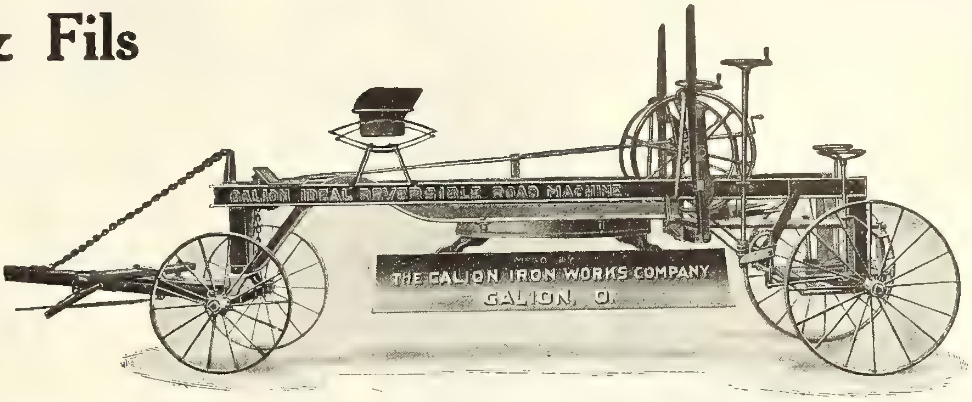
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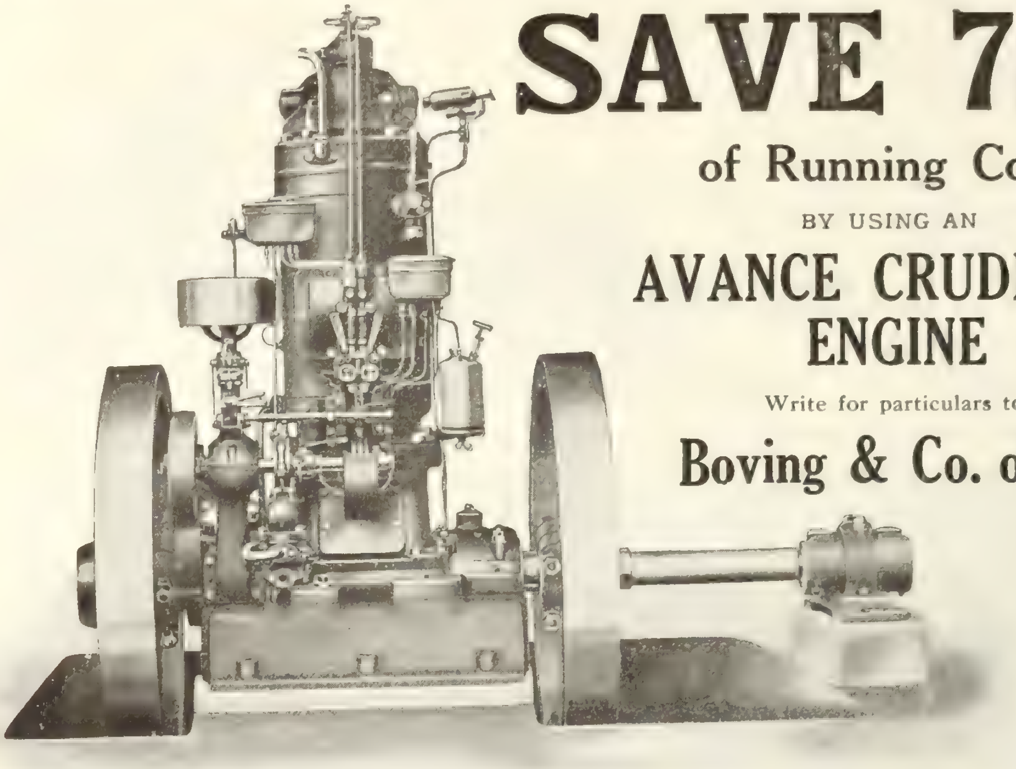

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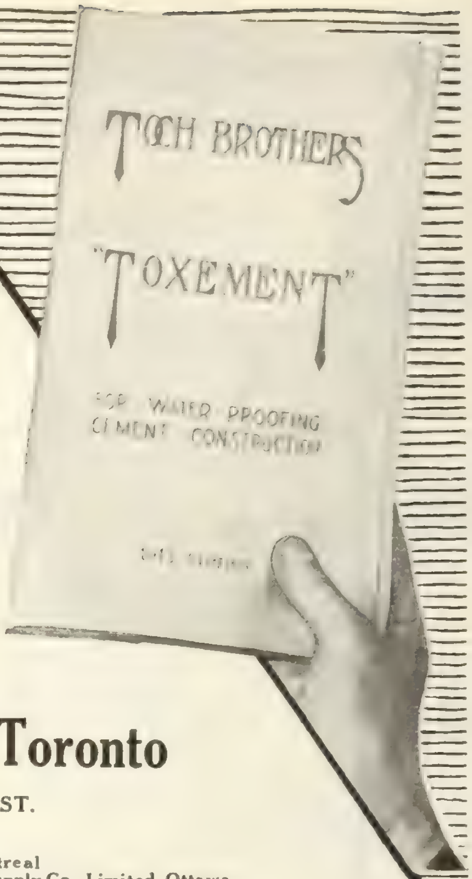

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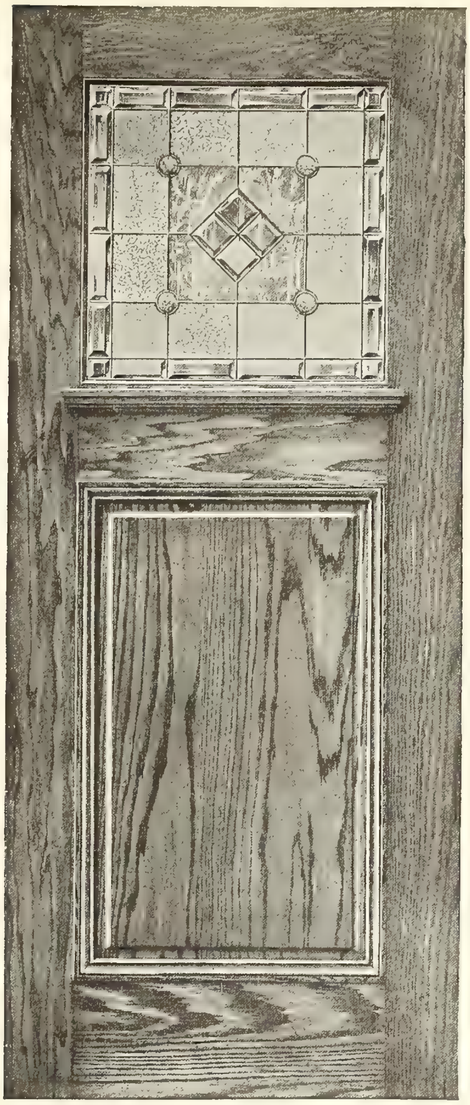

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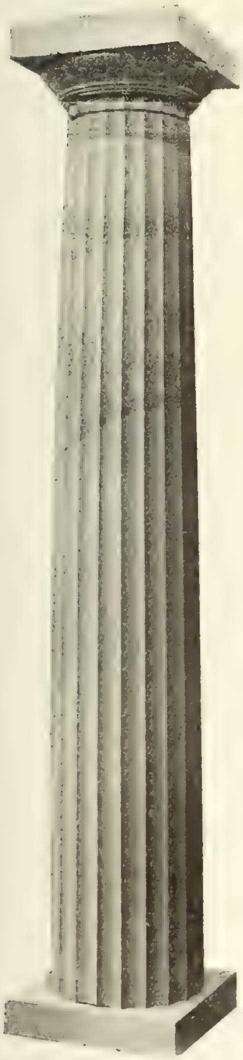

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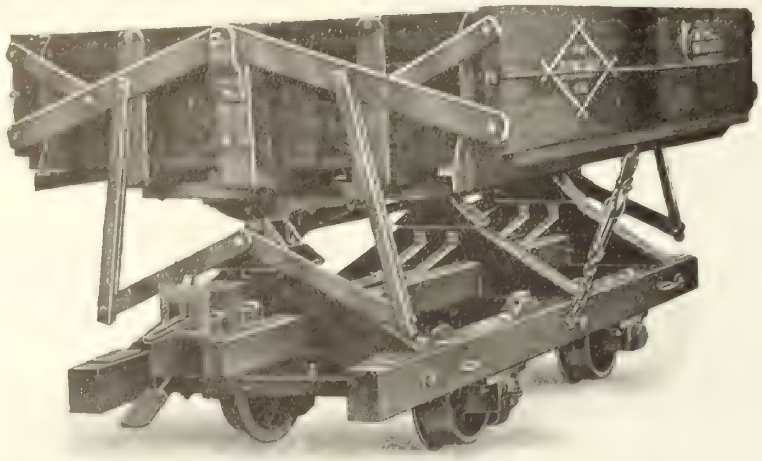

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Investigate the Thew Horizontal Crowding Motion.

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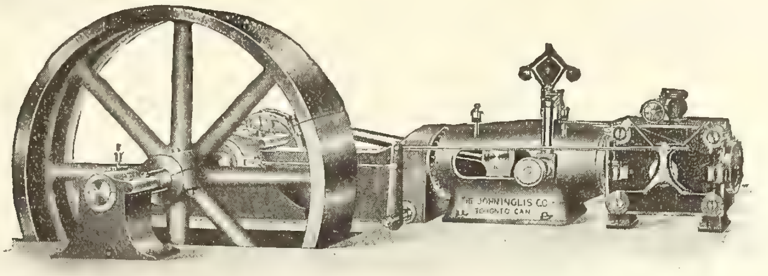

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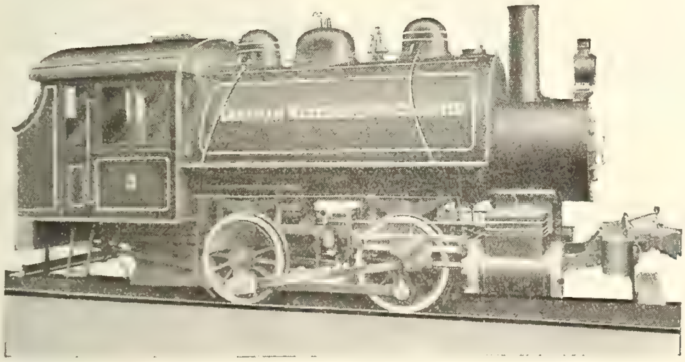

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Made with strong cast iron bases in following sizes:

6″ x 6″—8″ x 8″—10″ x 10″

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Made of strong and durable Materials.

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Takes up less room than other hoists—the opening in sidewalk need be a little larger than necessary to permit passage of can. The G. & G. Hoist is telescopic—does not show above sidewalk when not in use. A powerful Break Attachment permits the lowering of heavy loads without trouble.

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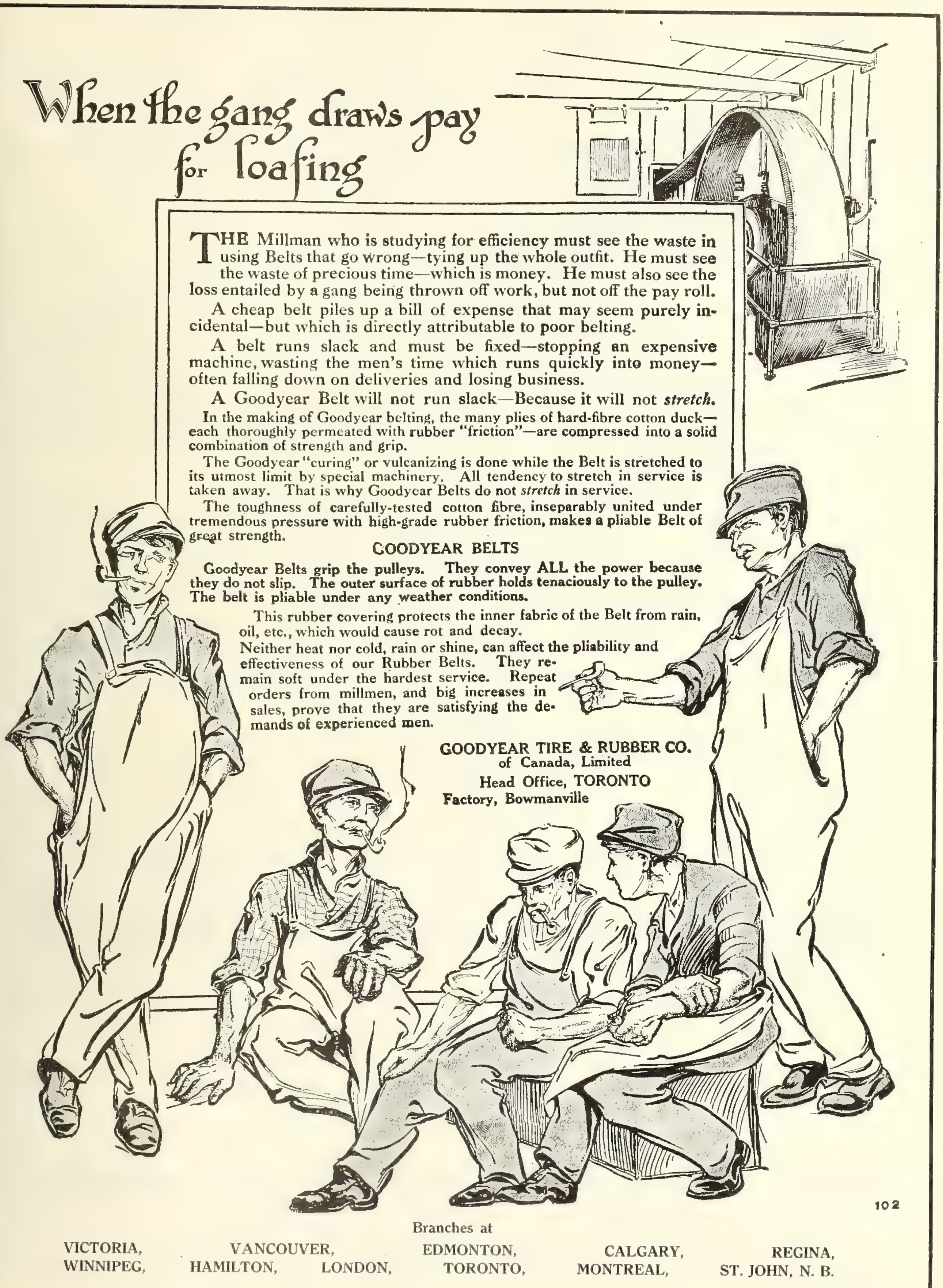

When the gang draws pay for loafing

THE Millman who is studying for efficiency must see the waste in using Belts that go wrong—tying up the whole outfit. He must see the waste of precious time—which is money. He must also see the loss entailed by a gang being thrown off work, but not off the pay roll.

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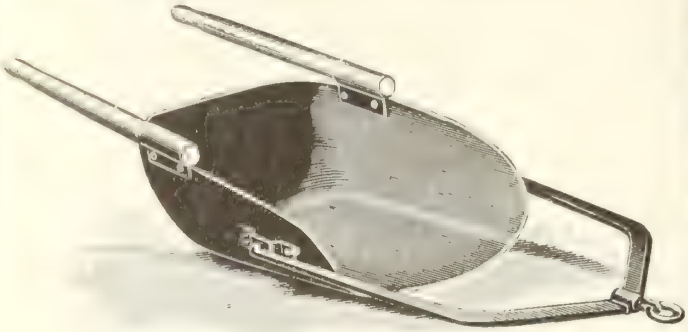

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The machinery in those early days, was crude and cumbersome and terribly severe on beltings, while lack of knowledge on their care and adjustment helped to aggravate belting troubles. In spite of these handicaps, our beltings "made good" from the beginning. It was evident that the principles governing their construction were right and the materials properly chosen.

Forty Years Ago The Demand For Our Beltings Was Purely Local
To-Day They Are In Use All Over Canada

THESE FACTS TELL THE STORY

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Canadian manufacturing conditions have been studied and analyzed and nothing has been overlooked that could make our Beltings better and more worthy of your confidence.

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We Would Like To Help You With Your Belting Troubles And
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We know that our Beltings will give you better service than you have ever had before. We would welcome an opportunity to prove their superiority. Why not let us convince you that our Beltings possess greater TENSILE STRENGTH, GRIPPING POWER, FLEXIBILITY and SURFACE TOUGHNESS than those you are now using.

Our nearest branch will gladly give you information
that will save you much money, time and trouble

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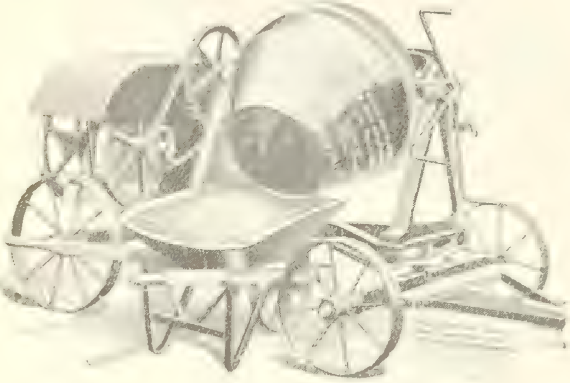

Little Wonder "Five" without Side Loader

You have to make money faster these days than ever before. You must do it by making time.

SPEED, EFFICIENCY, UTILITY--these are the keys to success. These are the winning features in WONDER Concrete Mixers. Not to know the machines is to be behind the times. Not to take advantage of them is to neglect a real opportunity.

LITTLE WONDER "FIVE"

"The Small Job Money-Maker"

THE WONDER "TEN"

"The Big Job Money-Saver"

THE LITTLE WONDER "FIVE" is the swiftest, simplest, strongest mixer ever known for building sidewalks, curbs, drives, foundations, etc. Saves 50 cts. per cu. yd. over hand mixing and pays for itself in a few days by its profits. Capacity 5 cu. ft. per batch. Mixes 35 to 50 cu. yds. per day. Side Loader practically doubles this capacity with only small extra investment. Endorsed by thousands of contractors all over the country.

The WONDER "TEN" is a 1-3 yd. "Sack to the Batch" mixer for **heavy work.** It will do the work of machines costing two or three times the price and make twice the money by its speed and greater utility. Embodies the same unique features that have made the LITTLE WONDER "FIVE" the fastest seller in the history of the concrete business.

Wonder "Ten" with Side Loader

TEN DAYS' FREE TRIAL

We will send you either size of the WONDER, with or without Side Loader, for Ten Days' Free Trial on your own work. If you're not fully satisfied with the machine in every particular, notify us within the ten days and we will tell you where to ship it and refund the freight you have paid. You are under no obligations whatever.

All we ask is to show you. Write TODAY

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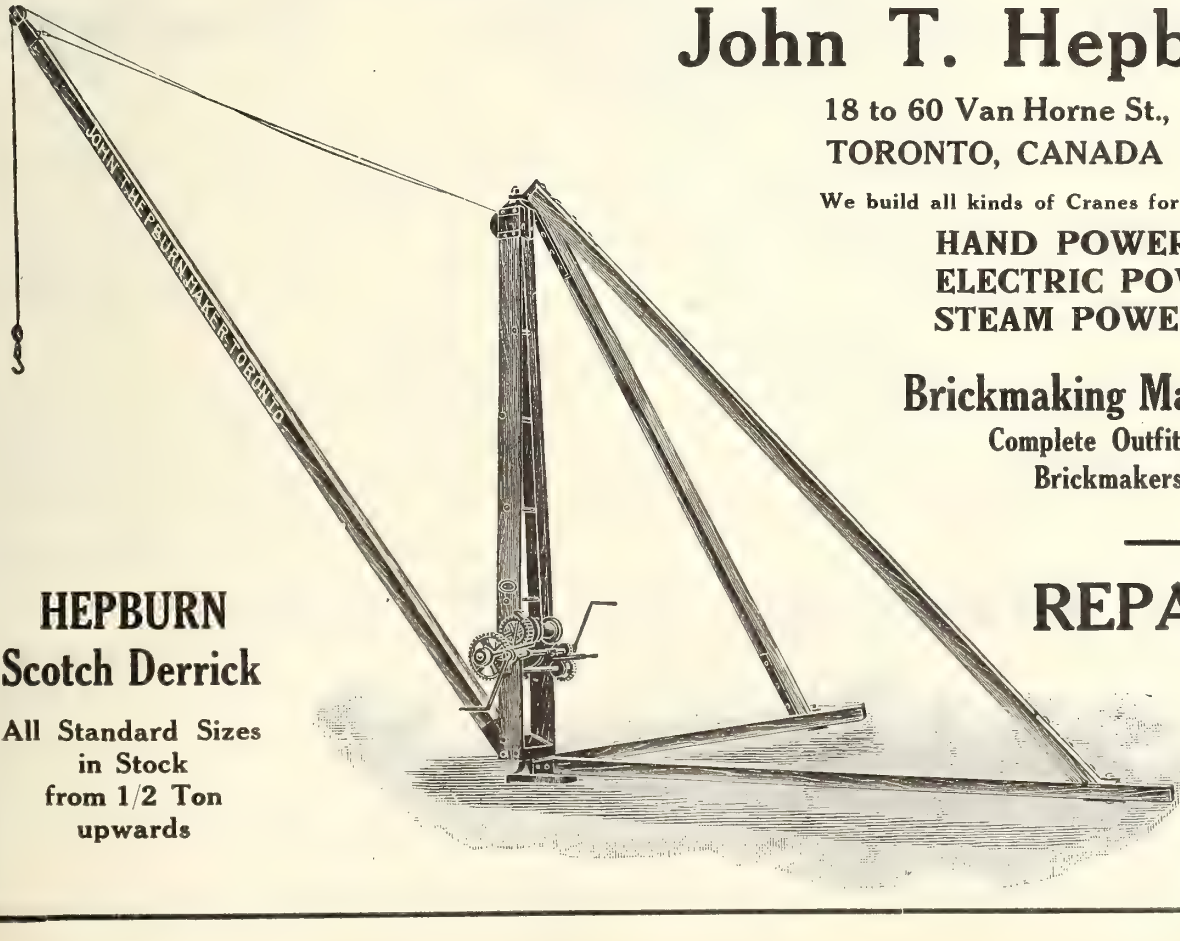
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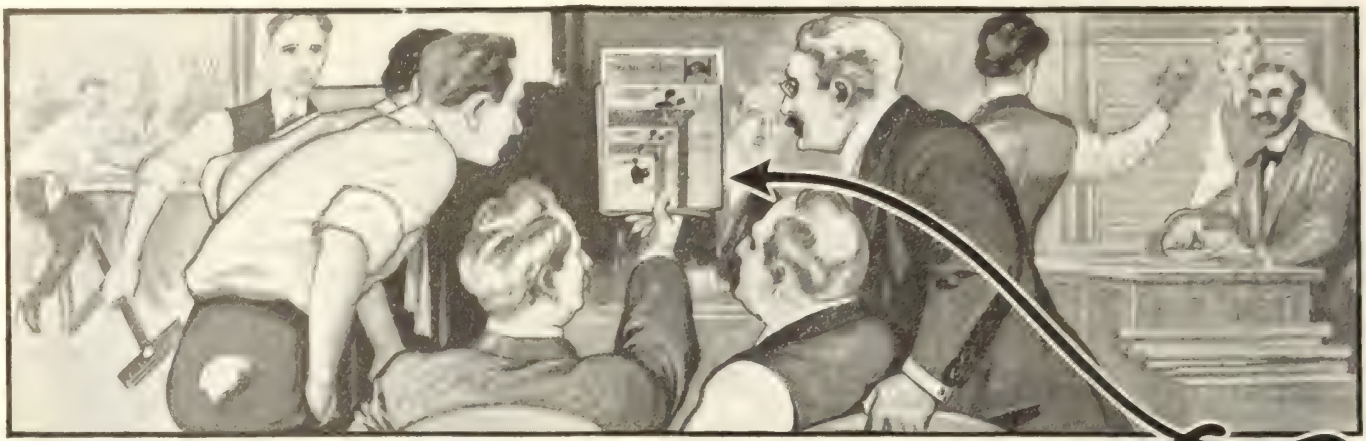

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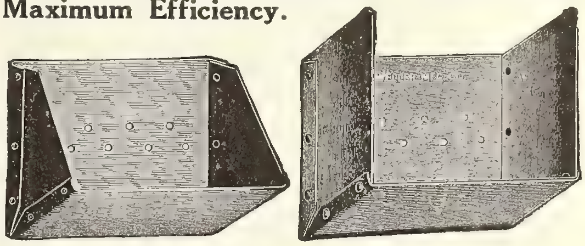

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Vol. 27 September 10, 1913 No. 37

Contractors' Methods on Railroad Construction

IN another part of this issue appears an article on methods contractors should follow in beginning a railroad construction contract. The writer of the article (Mr. D. J. Hauer, in The Contractor) also points out that the experience gained in railroad construction work is so broadening that the training thus gained will enable a contractor to handle many other classes of construction work. In handling the subject, the importance of starting right is emphasized, and in emphasizing them the difficulties of the contracting profession are brought out. The keynote is that a man must so arrange his work that he can make money from the start, which involves management and business capacity of a high order. Getting things started right is both an art and a science and is one of the big fundamentals of life. It means initiative, nerve and knowledge. The advice given in this article is of a nature which has been bought by many years of experience, and its patent logic should be heeded. Many contractors make great promises and many motions, but often find their work in poor shape, not possessing sufficient generalship to handle it efficiently. This can be overcome by close observation.

Another subject touched on is the rather hackneyed problem of harmony between the engineer and the contractor. By use of some tact, many contractors are able to get what they want from the engineer by way of stakes and plans, so that their work is not held up in any way, as harmony is a big factor for the successful prosecution of any kind of work. The history of construction unfortunately shows that many contractors have not paid sufficient attention to the all important subject of starting their work right, and it would be well and profitable for many to give more consideration to this subject. They should keep posted on methods of doing work and should know of the development which is going on in the machinery and equipment used for carrying on work. The old days have passed when contractors could make big profits by a fairly good guess, and contracting, due to competition, is beginning to be an exact science.

Waste in Bidding

MOST of our economic waste is due to a lack of a definite knowledge of costs. For instance, in a building project where seven or eight contractors, all of the same general class are called in to submit proposals on the work, there will be a difference of 30 per cent. between the highest and lowest proposal—all of which means that costs in this industry are largely a matter of opinion.

With costs only as a matter of opinion, the building public has no confidence that one man's judgment represents the lowest market price, so a group of men are called in to spend their time and money in making an estimate, and with no reward—only the hope of reward. All this is wasted effort with them all, save the successful bidder.

Very few people realize what it costs to make estimates on bidding projects, even though the basis of an estimate is not a matter of definite knowledge. Take a court house or city hall, say one costing a million dollars, exclusive of the heating, plumbing and decorations. It will cost each general contractor who submits a proposal $1,000 in travelling expenses and the labor of estimators. Say there are eight contractors figuring on the work. This means that through a lack of confidence, which has been created in the public mind by a lack of definite knowledge, a debt of $8,000 has been accumulated, which society, somewhere, somehow, must pay.

With smaller building projects the cost of making estimates is very much higher in percentage, double in some cases, and when we consider all the estimating of all the building in a year, the amount expended in both money and effort, in order that the owner may know the lowest market price, is a gigantic total and a frightful economic waste.

It has only been within the last few years that there has been any organized effort among building contractors to determine absolutely costs in the detailed operations of building, and with the same certainty and accuracy that the typewriter, adding machine, automobile, and low-price watch manufacturers know their detailed costs. This organized effort for cost finding has only been with the very large contracting organizations, and is of little value because they have the unfair competition of those who do not know their costs.

The average contractor in the average city has no definite knowledge of the cost of a cubic foot of brick work, a square of floor, a yard of plastering or the average cost of putting on inside trim, fitting such and hanging doors. The average knowledge of building costs is inherited—the present generation got their present basis of prices from their fathers or their former employers under whom they learned their trade. These prices have been increased in percentages from time to time as material and labor prices have increased, but no doubt the original basis of them was wrong.

The average contractor's bookkeeping, together with his cost keeping, is so indefinite that he does not know until a contract is completed or until the end of the year, or until he goes out of business, or dies, whether he has made any money or not. He may make money on one operation and lose it on another, or on one contract and lose it on another; he gets too much for one operation or one contract and not enough for another.

Then comes the moral effect of a lack of definite knowledge of costs. The shrewd owner finds that costs are a matter of opinion, and he at once undertakes to change that opinion by applying horse-buyer methods in order to get his building as cheap as possible; the contractor in turn takes this as a moral license to "trim" the owner at every point, even to the extent of slighting the work. The owner comes back with bonds, forfeitures and iron-clad contracts, all of which are childish, for no one can make a man do good work if he hasn't the free will with a profit as an incentive to good work. The building contractor has not made money in the same sense as other industries involving the same skill, responsibility and capital.

The solution of this evil is in very simple local organizations of contractors, not to control prices, but for the purpose of educating each other to costs. Price will take care of itself naturally if each knows his cost; for it isn't natural for a man to sell less than cost if he knows it. It is just the difference between knowledge and ignorance, efficiency and obstruction.

Red-Letter Contracts

IT cannot be but a source of gratification to those of a peculiarly patriotic temperament that in face of close competition with a number of the largest contracting concerns in the world, the Canadian Stewart Company of Montreal obtained a contract for nearly thirty-one million cubic yards of dredging from the Toronto Harbour Commissioners at a cost of five and a half million dollars. The work will be commenced next March and will take eight years to complete. An interesting feature of the contract is that the successful tenderers will have to construct two new dredges, which will be among the largest in the world. It will be recalled that the total amount to be spent on the Toronto harbour development is between nineteen and twenty million dollars and that the whole work will extend over ten years.

The Canadian Stewart Company already holds a contract for part of the harbour works, it having been the successful tenderer on an important section of the construction to be done on behalf of the Harbour Commissioners at the city's expense. Other large works in Toronto now being carried on by the Stewarts are the new Dominion Bank Building, at King and Yonge streets, the Canadian Pacific freight sheds on King street west, and the new Government House in North Rosedale. The Stewart brothers, partners in this concern, have offices in many cities, but are Canadians by birth.

* * *

THE award of a ten-million dollar contract for the new Welland canal to Messrs. O'Brien & Doheny will undoubtedly awaken interest in this section of the country and cause a fair-sized boom in a number of towns situated in the canal zone. It is of interest to note that the deposits put up on this work amounted to nearly half the total estimated cost. Ten tenders were received and each tender was accompanied by a deposit of $400,000. The successful contractors will make their headquarters at Thorold and will start work immediately. It is a condition of the contract that the work be completed by April, 1917.

Comparative Statistics for Municipalities

RATHER a good suggestion was made by Mr. Geo. H. Lees, Mayor of Hamilton, at a recent meeting of the Ontario Municipal Association in Toronto. Mr. Lees suggested that a considerable saving would be effected by municipalities if they were to pay more attention to the preparation of comparative statistics. The end in view would be to show every detail of cost in construction, maintenance and operation, and to enable one municipality to profit by the experience of the other.

In order to make this work really worth while, it would be necessary to have a government branch to act in a supervisory capacity. The whole scheme would entail a great deal of extra work and much re-organization, but carried out on the thorough lines which Mr. Lees evidently has in view, undoubtedly the scheme would redound to the advantage of the community at large. Mr. Lees knows of a large city in the Western States which saved $15,000 a year in its Fire Department by putting into effect an efficient accounting system. Possibly some attention to this department of municipal enterprise in Canada would be productive of interesting results. Every year a considerable amount of experimental work is carried out by the municipal authorities throughout the country. Much of this is costly and is ultimately proven to be of little value. If, then, the statistical plan which Mr. Lees has in mind will reduce the sum total of experimental work and give a clean-cut finish to our accounting systems, much as we dislike statistics, we say that it should be hailed with acclamation.

Below we quote verbatim from Mr. Lees' address:

"The efficiency of any government or management can only be judged by comparison. The immense value of comparative statistics is now well known in large business enterprises and I am satisfied that it would be an equally efficient instrument for supplying the information required for the intelligent and satisfactory administration of public affairs, and with a view to promoting a more efficient and economical administration of municipal affairs. I would recommend that the Ontario Government—or better still, the Dominion Government—be petitioned to appoint a properly qualified commission to devise a system of accounting to be used uniformly by all municipalities, requiring each to furnish regularly to the government such information as would enable them to compile and annually publish comparative statistics of the cost of constructing the different works, operating the various municipal services, the costs of civic government and other physical and general statistics of each municipality.

"These comparative statistics should contain among other things the total and per capita costs of government; costs of maintaining public services, police and fire departments, lighting, waterworks, street cleaning, scavenging, schools, hospitals, vital statistics, health conservation, etc.; the cost per foot, square yard, or other standard unit of constructing pavements, sidewalks, sewers, water mains, etc.; the total and per capita revenue obtained from each source. These statistics should be arranged for the convenient comparison of one municipality with another, and each with its own previous records. Such publications would become measures not only of municipal economy and efficiency, but of fiscal fidelity and honesty."

Calgary's Bad Example

MEMBERS of the Builders' Exchange at Calgary recently petitioned the city commissioners to institute the practice of calling for tenders for all work costing five hundred dollars or more. They suggested that the city engineer should tender at the same time and that if his tender were the lowest he should carry out the work. One would think this a very fair argument, but according to our information the matter received scant treatment at the hands of the commissioners, who thought that the local contracting community had received all the consideration to which they were entitled.

If this is the kind of thing to be expected under the commission form of government it would appear to be a strong argument against it. In making their representations Calgary contractors were reviving an argument that must be a most familiar one to readers of the Contract Record. The administrators of municipal affairs should have no authority to spend public moneys without competition. Lack of adequate restriction on this score has brought about many abuses the practice of which has left a stain upon the reputation of several of our larger cities.

Contracts involving the expenditure of $500 provide a fair margin of profit. In all such cases competition is essential.

C. N. R. to Spend Millions

SIR William Mackenzie, president of the Canadian Northern Railway, has secured the money necessary for the fulfilment of the C. N. R. Pacific coast terminal plans, and they are to be proceeded with without delay. Sir William stated last week that of the capital he had secured in London—an issue of $2,000,000 of 4½ per cent. terminal bonds, and an issue of $7,500,000 of five per cent. five-year notes—a large portion would be used immediately for western terminal development and the remainder for the building of an extension of the C. N. R. lines in Western Canada. Included in the C. N. R. Pacific coast plans are large yards and shops to be erected at Port Mann; terminal stations, etc., at Victoria and New Westminster, and at the city of Vancouver a project which involves an expenditure of $10,000,000, and which will take five years to carry out.

Montreal's Excellent Record

UPON more than one occasion this season, commenting editorially upon trade conditions and prospects, we have asserted that in spite of the alleged tightness of money it was not difficult to finance sound constructional undertakings; that speculative enterprises alone found it difficult to obtain backers. No better exemplification of the truth of such statements can be found than in the report of building operations in the city of Montreal. The total rolled up by the eastern metropolis during the eight months ending August 1 was $13,816,622, compared with $11,179,376 for the corresponding period of 1912.

The most conservative business man will admit that such an increase—some two and three quarter million dollars in less than eight months—is significant. It is estimated that the building permits of Montreal proper for 1913 will represent the expenditure of twenty-three or twenty-four million dollars. If the returns of the various suburbs were included the total would be augmented by about twelve million dollars. This gives a sum total of thirty-five million dollars—an impressive figure even in this day when we in Canada have become accustomed to many ciphers in statistics.

Building Inspector Chausse—guide, philosopher and friend to all those who are interested in the promotion of building enterprise in Montreal—is most optimistic concerning the outlook for 1914. When Mr. Chausse takes the responsibility of saying that prospects were never brighter it is fair to look for big things from Montreal during 1914.

Wanted—Work

The following verses appeared in a recent number of Colliers. They were written by Berton Braley, the official poet of the construction field:

Here we are, gentlemen; here's the whole gang of us,
Pretty near through with the job we are on;
Size up our work—it will give you the hang of us—
South to Balboa and north to Colon.
Yes, the canal is our letter of reference;
Look at Culebra and glance at Gatun;
What can we do for you—got any preference,
Wireless to Saturn or bridge to the moon?

Don't send us back to a life that is flat again,
We who have shattered a continent's spine;
Office work—Lord, but we couldn't do that again!
Haven't you something that's more in our line?
Got any river they say isn't crossable?
Got any mountain that can't be cut through?
We specialize in the wholly impossible,
Doing things "nobody ever could do."

Take a good look at the whole husky crew of us,
Engineers, doctors, and steam shovel men;
Taken together you'll find quite a few of us
Soon to be ready for trouble again.
Bronzed by the tropical sun that is blistery,
Chockful of energy, vigor and tang,
Trained by a task that's the biggest in history,
Who has a job for this Panama gang?

How to Start on a Railroad Contract

Practical Discussion of Methods to Follow Throughout—Success Dependent Largely Upon a Systematic Plan of Development

By Daniel J. Hauer.

THE writer has received numerous letters during the past few years from contractors as to how construction jobs should be started, and he has from time to time given suggestions along these lines, but railroad construction has not been touched upon, although several requests as to methods to be followed in this class of work have been received.

To some extent the suggestions that will be given are applicable to other classes of construction, especially wagon roads, aqueducts, canal building, and all work that has a long center line and a narrow right of way, in other words construction stretching over a number of miles of territory.

Railroad construction embraces many different classes of work, as earth and rock excavation, masonry work of all kinds, foundation work, timber and steel construction, landscape gardening, track laying and ballasting and the building of telegraph lines, fences and structures of many kinds. There is hardly any other class of construction that embraces so much or broadens a man as much as building railroads. A contractor, who has had experience in railroad construction and is proficient, is competent to undertake almost any class of work and carry it on in a satisfactory manner. His exacting and broad experience fits and trains him to solve almost any problem.

Without infringing upon the technical and theoretical side of the subject of railroad building, a treatise could be written on the practical side of this important work that would be an aid to both engineers and contractors. They both have many things to solve in common.

In fact there exists a need for such a book, touching on the survey surface and subsurface, the measuring up of work, the estimating of costs, the keeping of records, the staking out of work, the making of monthly estimates, the methods of handling the work, the finishing up and many other details. All of these things could be set forth so that there would be a greater uniformity in the work, and many mistakes could be avoided.

Some railroad construction jobs are advertised to be let but a more common way to obtain bids on railroads is for the company to have lists of contractors from whom they ask proposals. These contractors have in some way shown their ability and are selected to do certain kinds of work by the company. A contractor of experience can often have his name placed on these lists by seeing the proper officials of the railroad and furnishing references as to work he has done.

No matter how the invitation has come the contractor or a competent assistant should always be ready to go. The job may be one of some magnitude, and may call for numerous outfits to be placed on it, or the railroad company may have divided the work up into sections, and may let one or more sections to a contractor. At times the work may be the construction of a wharf, coal bin or some job that is confined to a limited area. Some railroads prefer to let an entire new line, terminals and all to one contractor, who completes it with his own forces or with the aid of other contractors.

Quotations First

When the call comes to bid, the first thing to do, before starting to visit the work, is to arrange to obtain prices on the various materials that may be needed. If ample time is given and unfortunately for contractors it seldom is, letters can be written to various dealers and manufacturers for quotations. Answers can be made by letters to the home office. If the time is short, these quotations can be obtained by telegraph and the telegrams sent to the place of bidding as there may not be time to come home to make out the proposal.

Quotations should be obtained on terra cotta and cast iron pipe, on explosives, on cement, on the common grades of lumber, on reinforcing metal, on piles and sheeting, and other articles that are generally used. Always ask for a delivered price. This gives an exact price to go upon to make estimates of cost, and at the same time the quotations if later accepted by letter, makes a contract for the material needed that prevents the contractor paying higher prices afterwards. Do not use market quotations published in papers, they are seldom reliable and they do not contain freight allowances. Many young contractors have gotten into trouble by using them. Get quotations from more than one dealer on each class of goods to be purchased, as only in this way is it possible to know that you are obtaining the lowest prices.

As soon as you arrive on the job ask for a schedule of quantities of work to be done and materials necessary. If it is found that unusually large quantities of any materials are to be used or special information is given as to the quality or character of the materials, communicate it at once to your dealers so as to obtain lower or more exact quotations.

Detailed Examination of the Work

The work of quotations attended to, the contractor's mind is now free to examine the work in detail. Don't do it from a car window, or any rapid moving vehicle. Take time to examine everything in detail. The best way is either walking or on horseback. See the entire line from one end to the other. If the contract is landed this trip can be the means of saving many dollars in carrying on the work, and it means, likewise, starting it promptly and conducting it throughout in an efficient manner.

Careful notes should be taken on the work and recorded so as to have all data and necessary information, not only for bidding, but for managing the work. The knowledge so gleaned will likewise assist in making a more intelligent bid. First of all the different classes of excavation should be noted and their location. This not only affects the methods of doing the work, but likewise the making of embankment and the distribution of the wasted and borrowed material. The line should be divided into sections, not by the mile, but according to the character of the work and the kind of plant needed to do the various sections. For each one a camp site should be selected, one that is convenient to the work and also situated so that supplies can be hauled to it.

The hauling of supplies is very important. Notes should be made of all receiving stations, both on railroads and water routes, the distances from various parts of the line, and the roads over which materials and supplies must be hauled. The conditions of the roads must be noted and the hills on it. A few steep hills may mean to double the cost of hauling, as the steepest hill will govern the sizes of the load to be carried. Routes should likewise be selected for bringing heavy machinery to the different parts of the work, and estimates made of the probable cost, as in beginning the job this is an important factor in keeping down the cost, but also in putting the job on a paying basis.

Quarries of suitable stone, sand pits, and supplies of timber and piles must be located, and information obtained as to the cost of developing and furnishing these things. Where tunnels are to be driven special attention must be given to these details, and also to the location of a power plant.

All of such information will be valuable for bidding and just as much so for planning methods of carrying on the construction. The quantities of excavation to be made should be tabulated, with the distribution of the excavated materials, and from this tabulation, which should include culvert work, masonry and bridges, a plan can be mapped out to carry on the entire job.

All such data will be valuable not only if the construction is to be done entirely with the contractors' own forces, but also if all or a part of it is to be sublet. Frequently subletting is attended with much worry and trouble, due to the fact that the work is not divided up into the proper sections and that the character of the work is not suited to the outfit of the subcontractor. See to these things and few subcontractors will fail, instead they will make money for themselves and for the general contractor.

The contract once landed and signed, the contractor is ready to begin work. He can now be likened to a general starting a campaign. He must assemble his forces and plan the method of his attack. With the information gathered in making the proposal he should now be prepared to go ahead. First of all a competent man must be placed in charge of the job. If all or any part of the work is to be sublet, he should be the one to do it. With the data gathered this subletting can be done to advantage, and the subcontractor will be able to get to work quicker for he will know the quantity of work he will have to do, the kind and amount of outfit he needs, the location of his camp and all other important details.

Selection of Plant and Equipment

The most vital thing in preparing for any job is the plant needed for it. With the data gathered as described and before the contract was awarded, the outfit needed could all be decided upon. Any tools or machines that had to be purchased could be arranged for at once by obtaining prices from the various manufacturers in that line, and asking for dates of delivery. This last is often overlooked, causing costly delays. With this information in hand orders can be placed for new machinery as soon as the contract is awarded. Dates of delivery can be fixed so that the machinery will arrive on time, and not ahead of time, causing unnecessary expense of rehandling and making expenditures for labor ahead of time, using up money that could be put to other purposes.

There are two ways in vogue of starting jobs. One followed by many contractors is to spend large sums of money and much time on preparing to do the work. They do not start any work until all tools and machinery have been assembled, and they are "organized," as they term it, to do the work.

The other method is to get men and teams with small tools at work at once, earning some estimates from the start, and thus develop the work for the larger installation of machines and allow the work of preparation to be carried on at the same time. By this method the work is developed so that some income is devised from the start. The machines as they are installed do their maximum work, and the heavy expense of starting the job is extended over some weeks.

The first method the writer does not approve. It is all right in theory, but does not work out in practice. On a large job, where many different kinds of machines have to be installed, the cost can run into many thousands of dollars, and although the machines themselves ought not have to be paid for at once, part payment is generally demanded, but the great item of cost is labor and this means a large expenditure of ready cash. Thus the expenses are running up and not a cent of income is derived. This money must earn for itself some interest and by this method it is slow in doing it. Thus, before the job is fairly started, it is in debt. In many cases this means that the contractor is hard pushed throughout the life of the job, and he does not derive any profit from the work until it is completed. Meanwhile he has lost many thousands of dollars in interest that would otherwise have been his.

This has been demonstrated by the way a number of contractors have handled their work on the Catskill aqueduct, being built by the city of New York, and on the New York State Barge Canal. Some have followed this plan and, after six or eight months, they have been compelled either to go into the hands of a receiver or to make some kind of a working agreement with their creditors, both of which are costly. In nearly every case that the writer knows of this could have been prevented by different management.

Method of Development

For these reasons consideration only will be given to the method of developing the work while the preparation is going on. The first tools needed on a railroad job are some axes, a grindstone, some cross cut saws, cant hooks, log chains and such tools as are needed for clearing the right of way. Men can be set to work on this at once. Native axmen can often be employed to advantage, while laborers are being brought to the job. A few hired teams can be employed to haul lumber. At once some kind of a shelter can be built for horses and mules, a large canvas will serve the purpose or boards and poles can be used and the structure improved after it is put into use. The stock for the work can be shipped to arrive as soon as this shelter is made. This will stop hiring teams and allow horses to be used in moving logs.

Meantime a cook shanty can be built and the feeding of men started at once. Also a large building for sleeping. These can be arranged for within a day or two.

As soon as a few hundred feet of right of way is cleared men can be put to work on the road opening up grade points in rock cuts or where steam shovels are to work. For a few days wheelbarrows can be used, then vehicles can be put to work. For scraper or grader cuts a gang of men can be put to work taking out stumps. For this a stump puller should be used and explosives should have been ordered at such time to have had them on hand to assist in this work. A cut cleared of stumps within a day or two will allow of scrapers and graders starting to work.

If there is any side hill rock work, where a cross section of the roadbed is partly in cut and fill, a large gang of men can be placed on this at once, and by blasting done with judgment a large estimate can be earned quickly to help carry on the work.

Pipe for culverts should have been ordered at once, but only in such quantities that it could be placed as it is received. To shove it and rehandle it is expensive, eating up much of the profit on this part of the work. To do this, the necessary foundations must be prepared and gangs organized to place the pipe as it is unloaded. There will be plenty of work for teams and everything should be planned to keep them busy, as idle teams mean a quick money loss.

While this work is going on the camp is being built and used. An office and commissary with a storehouse is needed promptly, and a good blacksmith shop. This, too, at first can be a makeshift building to be improved as the work progresses. If these buildings are constructed according to a well-thought-out plan, they can be used before completed, be built at a minimum cost and will serve their purpose much better than when the carpenter or foreman is allowed to build as he pleases.

Likewise the buildings for men can be built as the work is being developed. Men for a while will put up with inconveniences, but they will soon begin to grumble if the camp is not put in shape for them promptly. Doing this under their inspection will often please them much more than if everything had been completed before they arrived.

If one or more tunnels are on the line the portal work should be started as quickly as possible, and the power house site selected and cleared up. Then the building can be raised, one side being left out to take in the machinery. If there is no approach to the tunnel to be excavated the heading can be started so that the machine drills and columns can be set up as soon as they arrive.

Concrete and rock culverts should be started within a week or two. For these and other masonry work quarries should be opened up and developed. To start crushed rock work it is often possible to use up large boulders and surface stones, so that foundations can be placed promptly.

For steam shovel work, the ends of the cuts being graded, the tracks can be laid and temporary trestles built so that as soon as the shovels arrive they can be put in position and worked day and night if necessary. A steam shovel put to work in a cut that has not been properly opened up is worked to a disadvantage for some days and possibly weeks. Meantime the operating expenses are as great as though the maximum output is obtained.

Avoid Delay in Masonry Construction

One thing frequently overlooked in starting jobs is the masonry construction. Delays on this work mean delays on other parts of the work, and there is no reason, in most cases, why the masonry cannot be started promptly and carried on ahead of the grading. One reason for this is that the engineers for the railroad company are not always prompt in making up the plans for such structures, causing the contractor to lose valuable time. The contractor, by insisting, can often get the engineers to act more promptly. One thing he can do is to have his forms, material and cement on hand. Don't overbuy, especially at the start, but have a fair stock on hand and arrangements made to have orders filled promptly.

In starting a job do not do any work without stakes. Payments for work are often short or confused by it. Then in many cases mistakes will be made that will be expensive to correct. Ask for stakes and have them before starting any work. Foremen and others should be made to open up and keep in first class condition all classes of work so as to complete the job as it is carried on and save much dressing up in the end.

A job started in this manner will earn some estimate during the first month, while the second month a large and profitable amount of work can be done. It will be on a paying basis much sooner than by the first method and will be finished sooner, as the writer's experience is that even when everything is prepared before starting the work, there still remain many details to be attended to and the job has still to be developed. The time of preparation is to some extent wasted.

This method of starting is applicable to a long line, or to each section, or for each camp or sub-contractor. Try it and it will be found practical and businesslike.

Possibility of Water-Tight Concrete

THE question of whether concrete can be made in itself waterproof was recently asked Leonard C. Wason, president of the Aberthaw Construction Company, Boston. In reply, Mr. Wason was very emphatic in stating that not only can concrete be made impervious under ordinary pressures, but even under extraordinary pressures. By "ordinary pressures" is meant pressures due to heads 10 feet or below, while "extraordinary pressure" refers to standpipe pressure. It is simply a question of well-graded materials, proper proportions, and thorough workmanship, to get the maximum density. With good work, the Aberthaw Company have found that for maximum density a mix of 1:2:3½ is about correct, the aggregate varying from 3½:4. The time that should be given to mixing the materials is very important. On the best work done by the company the materials were kept in the mixer for five minutes. The amount of water is also very important. The point of plasticity can be judged by the eyesight, and the concrete should barely quake. The materials, after being mixed, must be handled very carefully so that there will be no separation of the same. To make impervious concrete structures, great care must be taken also in getting the joints clean before going on with the next day's work. In Mr. Wason's opinion, 99 per cent. of all leaky concrete building work is due to poor workmanship.

These considerations relate, of course, only to the possibility of obtaining impermeability in the concrete material itself. In structures where seepage occurs after placing, or where cracks admitting water are developed through settling or shrinkage or expansion, the problem is one of a different character calling for a corresponding difference in waterproofing treatment.

Design and Erection of the Boucanne Viaduct of the National Transcontinental

THE National Transcontinental Railway crosses the Boucanne River at a point 167.2 miles east of the Quebec Bridge, which is the St. Lawrence River crossing of the same line. The crossing occurs just north of the peak of Maine where this state geographically juts into British territory. Although the river at this point is but a shallow stream with a depth varying with the seasons from a few inches to 5 ft., and a width of some hundred feet, the valley in which it flows is quite a considerable depression. This condition, together with the fact that the line follows generally the "height of land," necessitates a crossing of 799 ft. length with a maximum height of 127 ft. from base of rail to water level. The bridge is therefore of the trestle type with the general outline indicated in Fig. 1. The viaduct will there be seen to consist of five towers of 30 ft. spans and two of 40 ft., with intermediate spans of varying lengths. Beginning at the west end there is first a 60-ft. span from an embankment about 55 ft. high to tower bent No. 1. The succeeding three open spans are 56 ft. and then over the river between the 40-ft. towers is a 150-ft. truss span. Continuing up the east bank, there are three open spans of 60 ft., the eastermost resting on the embankment which here also is about 55 ft. high. The line is on tangent except for about 135 ft. at the west end where it lies on the approach spiral to a 6 deg. curve (radius—977 ft.), which commences 165 ft. west of the bridge. The transition spiral is thus 300 ft. long and is laid out as a cubic parabola with equation $Y = KX^3$, Y being the offset from the tangent, X the distance from the beginning of the spiral measured along it, and K is a constant, in this case equal to .00000058232; so that at the end of the transition spiral when X = 300 ft., Y = 15.722 ft.

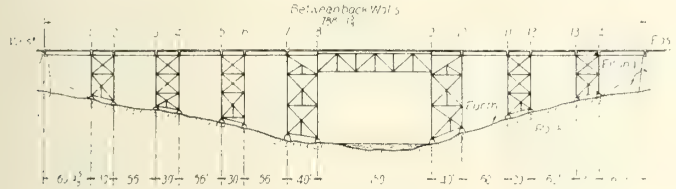


Fig. 1—Diagram elevation of Boucanne river viaduct.

The viaduct is of the deck type, and the track is laid on ties placed with a 4-in. space between them. The ties are 10 ins. wide by 12 in. deep and generally 14 ft. long, dapped ½ in. over the top flange of the girders and held from bunching by longitudinal timbers running along the ends of the ties and dapped over them. The girders are 9 ft. apart on centers and are uniformly 6 ft. deep. The transverse batter of the towers is 1 in 6 and this, together with the depth of the truss and its detail brings the width of the truss span to 17 ft. 2¼ ins. on centers. The viaduct is also on a grade of 1.10 per cent. falling toward the east. The grade is, of course, affected by the vertical spiral at the west end whereby the super-elevation of the 6 deg. curve is gradually attained, but not to any larger extent than can be adjusted by the size of the ties used on the end span. The necessary tilting of the track is also small enough on the bridge to be looked after in the ties.

The ground at the site is principally earth and boulders with solid rock about 10 ft. below, so that concrete pedestals and abutment walls were well founded on the bed rock.

Specifications for Design

The viaduct is designed in accordance with the specifications issued by the Dominion Government in 1908 with one or two further restrictions imposed by the Bridge Engineers of the National Transcontinental Railway, and which will be specifically alluded to later. The steel was proportioned for a live load known as class "heavy." This consists of two engines with tenders, the whole weighing 180 short tons, with a combined wheel base of 104 ft., followed by a uniform train load of 4,750 lbs. per foot of track.

The specification for impact calls for an extra allowance of load equal to the figure obtained by dividing the square of the live load by the sum of the dead and live loads. In addition to this gain, for all spans under 80 ft., including the stringers and cross floor beams of the truss span, the live load itself is increased by a percentage depending upon the length of span, and having a maximum of 40 per cent. at the theoretical span of zero, diminishing according to the formula $.40 - \frac{l}{200}$ where l is the length of span, vanishing at 80 ft. In the Transcontinental Railway bridges this increment in live load is introduced into the live load figure used in the impact formula as well as the pure live load, so that for the girders of the Boucanne River Viaduct the impact load was obtained by dividing the square of the increased live load by the sum of the increased live load and the dead load. The sum of the dead load, the increased live load and the impact thus obtained is treated as the total load both for shears and bending moments. For this load a unit shear of 10,000 lbs. per square inch is allowed on the gross section of the webs of plate web girders, and on the net section of the tension flange a unit fibre stress of 16,000 lbs. per square inch is permitted.

The gross area of the compression flange is made equal to the gross area of the tension flange and 75 per cent. of the gross bending value of the web plate is considered as effectively assisting the flanges to resist the induced bending moments.

Under these specifications the weight of steel in the 60-ft. deck plate girder spans is 57,000 lbs. per

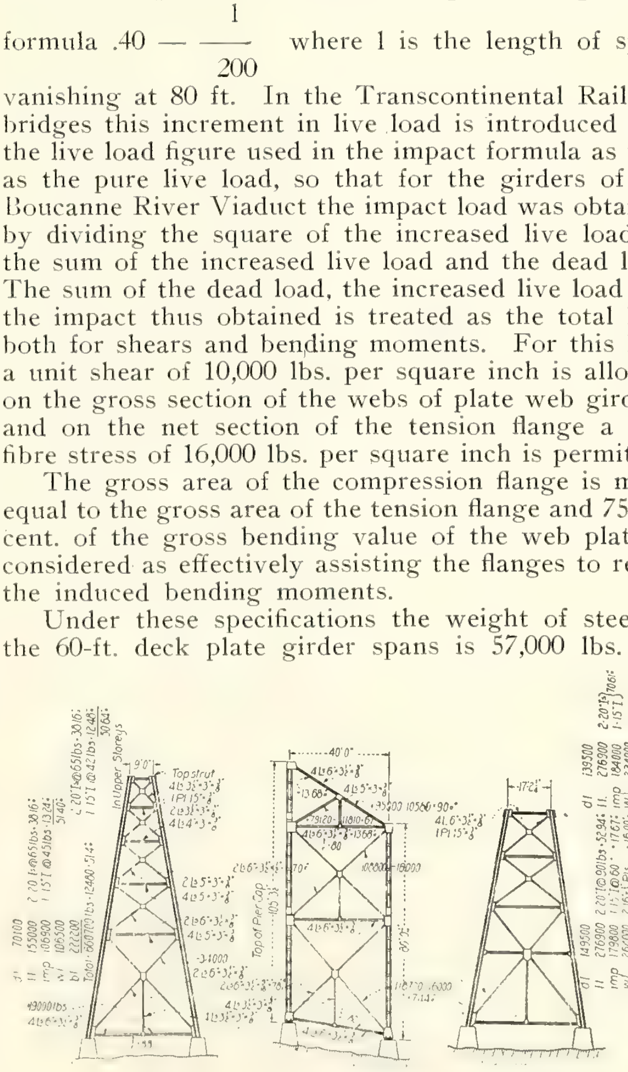


Fig. 2—Typical compression sections.

span, including both girders and all wind and sway bracing. In the 56-ft. spans the corresponding weight was 51,000 lbs. in the 40-ft., 29,000 lbs. and in the 30-ft. spans 17,500 lbs. per span.

Towers and Truss Spans

The trusses of the 150-ft. span, as will be seen from Fig. 1, have six panels of 25 ft., are in vertical planes, are 25 ft. deep between centers of gravity of chords, and are of the Warren type. The cross girders or floor beams at the intermediate panels are 4 ft. 4¼ ins. deep over flange angles and are riveted to the vertical members of the truss just under the top chord. The end floor beams which have to support the 40-ft. girder spans are 5 ft. ¼ in. deep over flange angles and are 1 ft. lower on the truss than the intermediate ones in order to accommodate the difference in depth between the 40-ft. girders mentioned, and the stringers of the truss span. These latter are also plate web girders, their depth thus being 5 ft. ¼ in. back to back of angles against the uniform 6 ft. ¼ in. of the girder spans. It will thus be seen that the stringer girders sit on top of the floor beams and are 9 ft. apart on centers, being in fact 25-ft. deck plate girder spans. The floor beams are similarly single-web plate girders with webs of 7/16-in. thickness and flange angles 6x6x 9/16 ins. on the deeper and 6x6x⅝ ins. on the shallower. The truss itself has a top chord section composed of a cover plate, two web plates about 14¼ ins. between them and four angles 6x4 ins., all being ½ in. thick, the web plates 20 ins. deep, and the cover plate 23 ins. wide. Figure 2 will illustrate this make-up. The bottom chord consists of two web plates 22 ins. deep and four angles 6 x 4 ins., all 7/16 ins. thick in the first two panels at each end and all ¾ in. thick in the two central panels. The web system of vertical and diagonal members is consistently of H shape, the plate being uniformly 12¼ ins. wide with a thickness of ⅜ in. except in the compression diagonals where ½-in. plate is used. The angles are 9 x 3½ x ½-in. bulb angles, in all the diagonals and the end verticals, whilst in the verticals that are merely hangers they are 6 x 3½ x ⅜-in. angles, and in the intermediate compression verticals 7 x 3½ x ⅝-in. angles. The main or end compression diagonal is further reinforced by 19 x ¾-in. plates on the outside of each pair of bulb angles. These sections are also indicated by Fig. 2

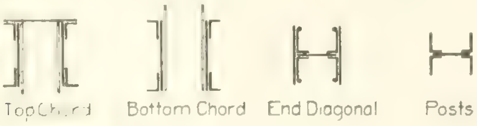


Fig. 3—Towers.

Fig. 4—Staging track on which tower was moved.

The maximum top chord stress, composed of dead load, live load and impact load, amounts to 678,000 lbs., for which a section of 50.5 sq. ins. is provided, the maximum unit compression allowed by the Transcontinental Railway engineers being 13,600 lbs. per square inch. The bottom chord receives a possible maximum stress of 768,000 lbs., which at 16,000 lbs. per square inch requires 48 sq. ins. of net sectional area. To meet this is supplied 48.76 sq. ins., being the effective net section obtained from the 60,760 sq. in. gross section provided. The Transcontinental Railway prescribes that the government formula for free ended compression members shall be used for their vertical struts, whilst for the compression diagonals the intermediate formula $16{,}000 \div \left(1 + \frac{l^2}{1{,}200\, r^2}\right)$ is used, the constant before r^2 being 9,000 for free ends. By this means the units are obtained and by their aid the necessary cross section. The tension unit is 16,000 lbs. regularly.

The trusses are braced together horizontally by both top and bottom lateral systems, the top consisting of crossed single diagonal angles in each panel connected to the under side of the chord angles and to the bottom flange of the stringers. The bottom lateral bracing consists of transverse horizontal struts of four angles laced in pairs and of cross diagonals similarly constructed. They are made the full depth of the chord for the sake of simplicity and efficiency in connection. Under each floor beam is supplied a sway brace consisting of cross diagonals connected to the vertical members of the trusses and to the bottom struts.

An interesting item, perhaps, is the size of the lattice bars and the clauses governing their dimensions. The lower side of the top chord is of course latticed between gusset plates, and here 5½ x 9/16-in. single lacing is used. The bottom chord is laced in both its upper and lower faces with 3 x ½-in. double lacing, whilst the lacing of all the lateral struts and diagonals is 2½ x ⅜-in. The clause in the specification that determines the thickness is that the bars should be at least 1/40 as thick as the distance between the rivers that connect their ends to the two leaves of the members which they lace, if singly laced, and 1/60 if doubly. On the upper chord the web plates being 14¼ ins. apart, the gauge line on the angles are 20¼ ins., which with approximately 60 deg. lacing gives 23 ins. between rivets and 23/40 in. or .575 in. as required thickness, for which 9/16 in. was used. The width is governed at each end, and these could not be obtained with the necessary edge distances on the lattice bar, under 5½ ins. Similarly on the bottom chord the same 20½ ins. with 45 deg. lacing gives 28½ ins. between end rivets and calls for $\frac{28.5 \text{ ins.}}{.60}$ or .48 ins, thickness in the bars. One rivet being sufficient connection, a 3-in. bar was adopted. The latticing in bracing members need only be made 75 per cent. as heavy as the above specification, and so ⅜ in. is the usual dimension.

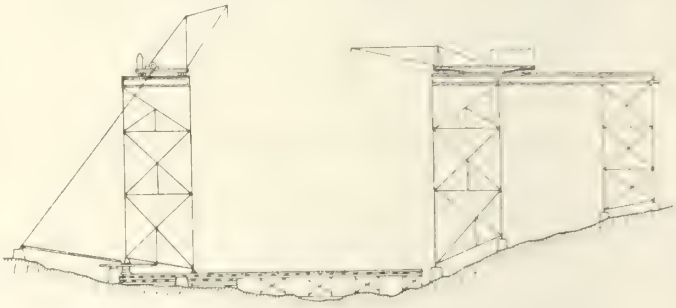


Fig. 5—Sketch showing method of moving tower.

The rivet values permitted are 10,000 lbs. per sq.

inch single shear and 20,000 lbs. per square inch bearing. These figures are for shop-driven rivets, whilst for those driven by power in the field a reduction in value of 10 per cent. is insisted on, and for hand-drivend rivets a decrease of 25 per cent. in value is prescribed. The gusset plates in the main truss were principally ⅝ in. and the minimum thickness of material allowed was ⅜ in. throughout the bridge.

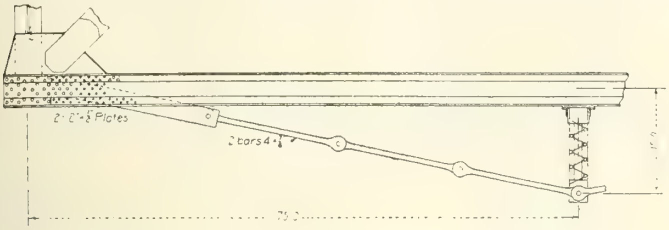


Fig. 6—Method of trussing bottom chord for erection in one piece.

The towers are of the usual viaduct construction, and consist of two "bents" braced longitudinally together. Each "bent" is made up of two battered posts with sway bracing between them. The sway bracing as indicated on Fig. 3 is composed of panels of crossed diagonals and horizontal struts. This is the most usually adopted type, although occasionally the struts are omitted except at the extreme top and bottom, and the diagonals made rigid enough to effectively resist compression. In the usual layout as typified by the Boucanne River Viaduct, the diagonals although made of stiff shapes are proportioned for tension with a limit of slenderness determined by making the maximum permissible ratio of unsupported length to radius of gyration equal to 200.

The horizontal struts are then figured as compression members and their stiffness is governed in turn by a clause limiting $\frac{l}{r}$ to 120. Under these conditions the stiffness more generally than the figured stress governs the choice of sections.

The longitudinal bracing between the bents is calculated to take any stress that might occur from suddenly applying or releasing the brakes on the train. Here, again, however, with the National Transcontinental Railway the same stiffness clauses come in and in the smaller towers determine the dimensions of the diagonals and struts, whilst in the larger towers carrying the ends of long spans the figured stresses often call for increased thickness of metal. A typical diagram Fig. 3 is appended showing computed stresses and supplied material for the particular tower to be considered in this paper.

The posts are made up of three I-beams rivetted together to form an H-section, reinforced by side plates where necessary. This form of post section provides the minimum of shop work and secures reasonable connections for all bracing. When the two I's are deep they may be connected at suitable intervals between bracing points by batten plates, or may be continuously latticed. In the case of the Boucanne Viaduct the bottom plate system was employed and 9 x ⅜-in. plates 1 ft. 3 ins. long were provided on each face at about 5 ft. intervals. In the tower 7-8 under consideration the lowest storey was built up of two 20-in. I-beams weighing 90 lbs. per foot each, with the diaphragm I-beam 15 ins. deep and weighing 60 lbs. per foot. In addition, there were two 16 x ½-in. side plates, one on the outside of the web of each 20-in beam, giving a total gross section of 86.6 sq. ins. The beams are heavy American standards and were rolled by the Carnegie Steel Company. The loads on this post, No. 8, are computed to be as follows:

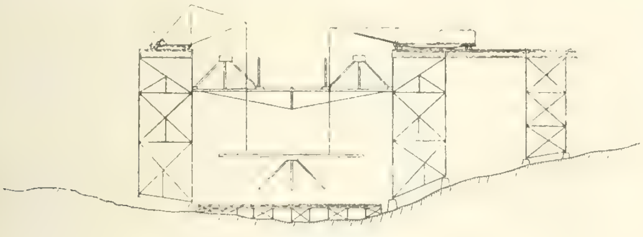


Fig. 7—Sketch showing method of erecting trusses.

Dead load	149,500
Live load	276,900
Impact	179,800
	606,200
Wind load	264,000
Brake load	231,200
Total	1,101,400

These loads are the maximum that can co-exist according to the specification and not necessarily the maximum amount of each and every class of load. Now the unit compressive stress allowed by the specification is that given by the formula $16,000 \div \left(1 + \frac{l^2}{9,000\, r^2}\right)$ This applies, however, to the combination of dead, live and impact loads which, as above detailed, amount to 606,200 lbs. In the storey under inspection $\frac{l}{r} = 72$ and consequently f = 10,150 lbs. per square inch. But in consideration of the remoteness of the possibility of all the wind load and all the brake load occurring together and at the same time as such a large impact load, which the braking load either removes or replaces, the allowed unit for the full combination of live, dead, impact, wind and brake loads is increased above that already determined by 25 per cent. There are thus two cases to be considered in every post—first, the ordinary combination at the ordinary unit; and, second, the extraordinary combination at the increased unit. In the present case, as with most cases of high towers and long spans, the second case governs and so the unit of 12,688 is used, necessitating 87 sq. ins. of section,

The feet of the posts are shod with a steel shoe plate 2 ins. thick which rests upon a steel bed plate 2 ins. thick, the latter being anchored to the pedestals. The anchor bolts for bent 8 were 1¾ ins. diameter and 6 ft. long, two to each post, whilst to bent 7 were given 2½-in. diameter bolts 13 ft. 3 ins. long, two to each post. A few inches of each bolt project above masonry to receive nuts and washers above shoe plates, and the rest is built into the pedestals. A space is left around the bolt to allow of slight adjustment and then after the towers are completed this space is filled with cement grout.

One post of each tower was rigidly fixed to its bed plate, but the other three were allowed freedom to move under expansion or contraction from temperature or loading. Each of the posts adjacent to the fixed one is permitted to move in the direction of the line adjoining to the fixed one; that is, the one transversely to the viaduct axis and the other longitudinally with the viaduct axis, while the diagonally opposite post can move in any direction. In other words, one shoe being fixed two had one degree of freedom and the other two degrees. Tongue and grooves in the bed and shoe plates, respectively, were used to accomplish this, and in the particular tower under notice the S. E. post was the fixed one. The tongues were 2½ x 5/16-in. flats and the grooves were planed out 7/16-in. depth.

Erection Methods

The viaduct was erected from the east end, and as the line itself was the only approach, the steel had to be forwarded from Montreal to the station on one of the existing railways nearest to the constructed track. This meant the carrying of all steel by the derrick cars from the east end storage to the actual site and over the erected portions. The process, therefore, was to erect bent 14 and place the 60-ft. girders from the east embankment. The derrick then moving into the 60-ft. girders erected bent 13 and the longitudinal bracing and the 30-ft. girders. This method, obvious and ordinary, was followed to bent 9. For the higher bents a horizontal temporary strut is employed to steady and support the first bent of a tower, being erected between it and the last completed tower. These temporary struts serve to stiffen the bent while the 60-ft. girders are placed and the derrick advanced to erect the rest of the tower. They were wooden in the case of the Boucanne River Viaduct, but are of steel for larger and higher towers.

When the tower 9-10 was completed, the next necessary undertaking was bent 8, which in its final position was to be 150 ft. west of bent 9. As this could not be erected from the west end, there being no line, it was essential to scheme out some method of building the complete tower 7-8 before the truss span which it was destined to carry. Although the river was but a foot or two in depth, falsework for the truss was considered too expensive and troublesome, and the plan now to be presented was selected as the most feasible and desirable means of erecting both the trusses and the tower. The outline of the scheme was the building of tower 7-8 on low staging close to 9-10 within reach of the derrick booms and approximately at its final level, and then rolling or sliding it westward into place. The company had before had experience with the moving of towers by this means and were satisfied from past successes that this was a possible and practicable scheme. Temporary wooden staging was built across the river upon which were laid the skidding or rolling track rails. These were laid at such a height that between their bases and the top of the pedestals of 8 there was just room for an ordinary railroad tie and an inch or two of blocking, Fig. 4. On top of these rails were then built the posts of bent 8. This base of bent 7 being 6 ft. higher than bent 8, this amount of timber blocking was built upon the rails 40 ft. west of bent 8 and upon this small timber tower bent 7 was erected. When the bracing and 40-ft. girders of this tower had been completed a stiff-leg derrick was built on top of the tower by the erection derrick on tower 9-10, Fig. 5.

Between the shoe plates of bent 7 and the blocking upon which they rested was placed another set of rails, so that when the tower had been rolled westward until the blocking under bent 7, having passed pedestal 8, was about 8 ft. from pedestal 7 they would project over pedestal 7 and when staged or blocked, would form a track upon which the shoes of bent 7 could slide the last few feet of their travel, the shoes of bent 8, of course, still rolling. Thus for the first 135 ft. or so the two bents of the tower rolled on the lower tiers of rails and afterwards the higher shoes slid on the upper tiers. The rollers were 2 ins, in diameter and about 4 ft. in length. In this manner the towers was rolled to position and then jacked down onto its anchor bolts which were already in place on the pedestals. The rolling was effected by the winding engine of the stiff-legged derrick on top of the tower rolled. Lines from its spools to a hitch west of pedestal 7 passed back to the tackles, which were placed around posts at gussets and around the blocking under 7. The derrick up above thus pulled the tower carrying it into place. The movement was very easily accomplished and without any trouble or hindrance.

The next problem was the erecting of the truss span. The two bottom chords were lowered piece by piece to the staging already referred to, a few feet only from the ground, and there they were bolted up and trussed as shown in Fig. 6, by temporary eye bars and short struts. By this means they were made strong enough to carry themselves and a part of their respective trusses as spans of 145 ft. 6 ins. length. The end vertical posts of the trusses had, of course, been already erected as part of the towers and the bottom chord and splices were arranged to permit of the trussed chord being hoisted vertically and immediately bolted to the short end sections, which were shop riveted to the gusset plates at the foot of the vertical posts incorporated into the towers. By this means the two bottom chords were hoisted into place and connected, the stiff-legged derrick on 7-8 taking hold of about 40 ft. out and the main traveller taking hold of about 50 ft. out. The bottom lateral bracing was then put in place and the chords thus stayed horizontally.

The next process, Fig. 7, was the erecting on the low staging of the web members of the two panels at each end of each truss; that is, the main compression diagonal, the first vertical and the main tension diagonal. These were then hoisted into place and immediately braced by the placing of the first floor beam and sway bracing. The second verticals being added, the remaining central portion of each truss was assembled down below with the four panels of top chord and then similarly hoisted up to position and bolted on. The intermediate floor beams, sway bracing and top lateral bracing followed and the addition of end sections of top chords and stringer girders completed the span. When sufficient rivetting had been done the temporary eye bar trussing was removed and everything was ready for the laying of track and the passage of the erection derrick. The stiff-legged derrick was dismantled and the erection of the remaining towers was proceeded with on the same plan as above described for the eastern shore. The photograph of the placing of the last girder is interesting in that it shows the device whereby a brace frame is hoisted above the second girder of a span, so that immediately both girders are correctly placed they can be braced together.

The main erection derrick had an interesting feature in its telescopic booms. They were built of steel sections in two lengths each, and so arranged that the outer half could enter the inner half and the effective boom thus shortened. Holes and pins were provided in the webs of each position of each boom whereby various lengths could be obtained and retained. The capacity of the booms was 15 tons per boom when shortened down to about 40 ft., and 10 tons each when acting at their full extension of 62 feet.

The greatest weight lifted in this viaduct was about 20 tons, divided between the derrick and the stiff-leg erected on tower 7-8. This weight comprised the center portion of the 150-ft. span, was 394,185 lbs., and the total in the viaduct 913 tons.

The steelwork was manufactured and erected by the Dominion Bridge Co., Ltd., of Montreal, under the supervision of R. F. Uniacke, Bridge Engineer of the N. T. C. R.

Mr. F. P. Shearwood is the Designing Engineer of the company, and Mr. J. Finley the Erection Superintendent, while the author as Assistant Designing Engineer was in responsible charge of the designing of the work above described.—Engineering & Contracting.

Permanent Way at Million Dollars a Mile

Three-Mile Fill of Canadian Northern Railway Across Rainy Lake Nearing Completion—Double-Tracked Granite Highway

THE milestones of progress in Canada are bedded deep in the spectacular engineering achievements of its building railways. In this land of distances, trade is transportation, and in every case where the genius of the constructing engineer has triumphed over the obstacles of Nature, commerce has experienced an acceleration marked enough to attract wide attention. Every one is familiar with the great works of the older roads, but, until recently, little has been heard of the conquests of the Canadian Northern in this department of railway building. That virile, progressive road, which is rapidly attaining the status of a transcontinental by the linking together of its separate clusters of line, has many remarkable monuments to the outstanding ability of its builders. Within the next few years it will have added to these its tunnel and terminal in Montreal, its tunnel and terminal in Vancouver, and it will also have succeeded in stretching a great double-tracked causeway of granite across Rainy Lake, about midway between Port Arthur and Winnipeg.

Three and a quarter miles of drilling are involved in the driving of the tunnel through historic old Mount Royal in Montreal. From three to four miles will probably be necessary for the entrance to the terminals in Vancouver. This rockway across Rainy Lake will be almost three miles long and will cost nearly one million dollars a mile.

C. N. R. Unheralded

In this country the railways have developed the habit of proceeding with great constructive projects without initiating the public to the significance of the work. There has been no departure in this case, The Canadian Northern have been engaged upon it continuously for the past two or three years and so quietly has the task been conducted that very few people in Canada to-day are even aware that anything out of the ordinary is occurring there. Yet so much progress has been made that the company looks forward to its early completion. Indeed it is even hinted that the heavy wheat trains from the west this fall will roll smoothly over its solid length on their way to the waiting freighters at the head of Great Lakes navigation. While this is hardly probable, owing to the nature of difficulties still to be met, it is so far advanced as to be an importnt factor in transportation in Canada in the near future.

The Canadian Northern Railway came into existence just when the tide of immigration from other countries began to be deflected Canada-ward. It came into the national life because of the compulsion of the need of additional transportation facilities. If Canada's expanding prosperity continued many new lines had to be built, especially in Western Canada. The nation's need, and calls, were responded to by two men, builders of railways, who secured a dormant charter and laid down two lines of steel across one hundred miles of new, sparsely-settled land in Manitoba. That line was completed about Christmas-time in 1896 and was operated successfully. It connected the village of Gladstone with a settlement which is now the thriving town of Dauphin. Immigration continued to increase rather than diminish, and, in response the lines of the new company began to nose their way out over the new country that has been selected for the founding of homes by the newcomers. That was less than seventeen years ago. To-day the one hundred miles has grown into nearly seven thousand, has spread over six provinces, and will shortly graduate into the transcontinental class with terminals at both Atlantic and Pacific tide-water. In the beginning the road was consecrated to development and the vows have been kept down to this day. The Canadian Northern did not follow the lines of least resistance. It did not parallel existing lines. The policy was to avoid that. The road wanted to give transportation where its blessings had been sadly lacking before:—sought out new territory and then started in to increase that particular district's population and prosperity.

At the beginning of this century the development of the western province demanded a new outlet to lake navigation. The Canadian Northern set itself to the task and in 1901 construction was in progress on a new line to connect Winnipeg and Port Arthur. Conditions compelled rapid construction. Consistent in its policy the company sought a route for its line to the south and finally decided to tap the iron deposits of the Atikoken and Mattawin ranges in the hope that great development would follow the steel. That development is taking place to-day. But the line as located crossed an arm of Rainy Lake. That could not be avoided and the desired object attained. The crossing proved difficult and threatened to hold up the opening of the line. The west was impatient and the company finally decided to throw a series of trestles across the three miles of water and open the road at the earliest possible moment.

Survey Made in 1910

In 1910, with its transcontinental rapidly taking shape, a survey was made to locate a crossing worthy of the project. It was thought first that a series of steel bridges would do. This did not work out. The investigation continued and a little later the news filtered through that the company seriously contemplated the building of a double-tracked permanent way of rugged granite construction. This was to connect a series of little, rocky, pine-clothed islets from mainland to mainland. Work began without fuss. Soundings were taken with rods driven down to the rock and the location determined in similar manner as where hills and valleys have to be contended with. Estimates were compiled of the number of tons of rock required to get down to solid rock. Incidentally these estimates were later completely vindicated.

Early in the summer of 1910 the contracts were let and preparations for the task begun. By July station men were starting short fills out from the shores of some of the islets. On September 16 of the same year the first big "shot" was fired and in October digging by the steam shovels was inaugurated. That winter two shovels were kept at work and in the following summer four were in commission. Until the fall of last year those four shovels attended by eight standard gauge locomotives, two "dinkey" engines, and sixty dump cars, forwarded a steady stream of rock to the dump. The biggest output in one month was 50,000 cubic yards of rock. For one steam shovel in one day the record was 155 cars, or, to translate, about 900 cubic yards. Some single rocks loaded by these 90-ton shovels weighed more than twenty tons. On May 1st, 1911, dumping commenced on the second channel filling, three thousand feet across. Forty train loads of rock, every day for a year, were dropped before this was completed. Repeatedly, for two weeks at a time, this dumping was continued within a car length before the tracks could be extended ahead. Sometimes sudden settlings occurred during the working hours and trains and crews had narrow escapes.

Electric power—a voltage of 6,600—is brought from Fort Frances. That is a distance of seven miles. Two motors of two hundred horse-power each run two compound air-compressors which supply 1,046 cubic feet of free air per minute to one hundred pounds per square inch, at which pressure pipes carry this air to the drills. These put down holes as far as twenty-eight feet tapping, in diameter, from three to two inches. Following the drillers come the "powder" men, who spring the holes repeatedly with dynamite until a pocket large enough to contain the explosive necessary for a giant blast, is made. Then a group of holes are loaded and wired. They are fired by electric current. These are the so-called "big shots." Of this class there have been about 75 averaging from ten to fifteen thousand cubic yards. The largest contained 56,000 pounds of dynamite and broke up 50,000 cubic yards of rock.

The total rock filling will aggregate nearly a million cubic yards measure, solid, in original position. The average haul was one mile. The work is so big that one fails to grasp it until actually following the rock from blast to end of grade. The shovels load a car with broken rock in five minutes.

Remarkable Features

There are some remarkable features about this work. It will bulk large enough to create an impression of awe and astonishment in the mind of the casual visitor. From that standpoint it will appeal to the general public. But to the engineer and the man who knows something of the difficulties always attendant upon colossal construction works, the conditions peculiar to the building of this rockway and the methods resorted to by the contractors "to win out" will comprise its greatest charm. There are always problems to be met in building a permanent way through water. In this case the C. N. R. had to meet difficulties greater than usual owing to the length of the "fill" over all, and, the depth of the water. Besides, Rainy Lake is navigable and the passage of the steamers and also the timber to the mills at Fort Frances and other points in the Rainy Lake country could not be interfered with. To meet the latter exigency the company decided to throw two lift bridges of modern type across two water ways at convenient points. As there is nothing very new about that the accomplishment is only a matter of time. But in the beginning the contractors spent many an anxious hour in evolving a method to successfully do the apparently impossible in dumping rock ahead of the fill in water. The man who finally submitted the adopted plan established a precedent in engineering as far as can be learned.

The dumping apparatus really is a floating bridge. It consists of two plate girders six feet high and 140 feet long. These are placed 30 feet apart and support a pair of tracks as on the ordinary bridge. The forward, or water end, is floated by a barge 34 feet wide and 112 feet long; the embankment end, rests on the permanent way when the dumping is in progress and is upheld by a cross-wise truss between two small barges, one on each side of the grade when floating is effected to a new position ahead. The trains loaded with rock are run out on this floorless bridge and the contents of the cars hurtle down to the lake bottom. About one-third of the grade is added afterward by side dumping as the bridge is moved on.

Hope has been entertained by the Canadian Northern that the big rock fill would be ready for operation this fall. That is possible, but from the nature of the work still to be finished it is likely the opening date will have to be extended into 1914. That means it should be ready for service about the time the C. N. R. connects its eastern and western Canada lines by the completion of the steel between Sudbury and Port Arthur. It is stated positively that the steel will be laid on this line by the end of the year. It will be given its final touches for operation as rapidly as possible. The line through Yellowhead Pass that will join the western provinces with the Pacific coast at Port Mann and Vancouver will not be finished till a little later. But it is being driven through as rapidly as any other piece of Canadian Northern line has ever been driven and through transcontinental trains should be leaving Montreal, Toronto Ottawa and other eastern cities in 1914. That line complete will be a revelation. It will have gradients as low as any cross-continent lines in the world.

No matter how old and hard, paint or varnish can be softened in a few minutes so that it can easily be scraped off, by applying the following mixture: Waterglass, 5 parts; soda lye, 40 degrees Baume (27 per cent.), 1 part; ammonia water, 1 part.

Experiments are being made in France with a roadbed material consisting of an intimate mixture of "iron straw" or iron in the shape of a wiry or fibrous mass such as is commonly used for cleaning and scraping purposes in this country, together with cement mortar and sand. Such material is called "ferro-cement," and it appears that tests are giving good results. But the iron is not the usual kind found in commerce, but is prepared specially for the purpose by suitable machines of appropriate design.

A Practical Method of Following Up Construction Work

By Alden W. Welch

THE purpose of this article is to outline a comprehensive method for following up construction. The system offered herewith is not an accumulation of theories begging trial, but, having been thoroughly tried out by one of the great central-station companies of this country, and declared adequate and efficient, is well worth careful consideration. One vital point that should not be overlooked when examining a new system is that one great characteristic of a system is imperfection. It is rarely possible to design a scheme which will work entirely satisfactorily for even similar conditions. The idea or skeleton will fit similar conditions, but the details will probably require readjustment.

Being connected with a large amount of construction, I found it necessary to evolve some good methods for following up the separate jobs, both in the aggregate and as regards their respective parts. The following method is suitable for the use of any concern having a large amount of construction work done, or of any engineering firm whose duty it is to be responsible for the satisfactory progress of such work.

We will assume that a certain central-station company has let the following contracts:—

At Generating Station A

Contract 100—Furnishing and Erecting Structural Steel for New Boiler House to House 20 Boilers.

Contract 101—Furnishing and Erecting Walkways, Stairways, Ladders and Miscellaneous Steelwork for the Coal and Ash-Track Runways, Hoists, and Monitors, over the Coal Bunkers in the Existing Boiler House.

Contract 102—Furnishing and Erecting Structural Steel for Roof over Yard between Old Boiler House and Machine Shop.

At Sub-Station No. 13

Contract 103—Construction of a Modern Sub-Station for the Distribution of Electric Energy at 2,400 Volts, Two-Phase.

At Sub-Station No. 14

Contract 104—Excavating for and Laying Foundations, for New Sub-Station No. 14.

Miscellaneous Building Jobs

Contract 105—Construction of a High-Tension Switch and Bus House.

Contract 106—Construction of a Stable and a Storeroom for Transmission and Distribution Material.

The foregoing are not hypothetical jobs, but represent actual work which at the present time has been completed and can, therefore, be analyzed with accuracy.

The first job to be considered will be that covering the steel work for the boiler house at Generating Station A. For the purpose of keeping track of the important details a form should be prepared. It is not the intention of this article to explain at length the various features connected with these jobs as they are not the points to be emphasized. Instead, I wish to show how my method may be applied, not only to these specific jobs, but to any work of a similar character. An idea of the scope of this boiler-house contract may be gathered from the following tabulation:—

Examination of this table will show that the important details have been laid out in logical sequence. First, the grillages, columns, floor beams and girders to the main floor, to the bunker floor, and to the track floor are considered. Lastly, the roof details are given. This form is primarily for the purpose of getting the material upon the job in ample time. The form is to be filled in with dates corresponding to the times when the various parts of the work were ordered, shipped, on the job, erection begun, and job completed. The first dates to be inserted will be the various promises on the above. These may be written in pencil. Should it prove impossible to meet these promises, the new ones should be inserted after crossing out the first. The old ones should not be erased as they are often of value in showing what was expected of the contractor, and what was actually accomplished. When the work has been completed this date should be inserted in ink.

CONTRACT 100
ERECTION OF ALL STRUCTURAL STEEL FOR BOILER HOUSE.

	MAIN FLOOR				BUNKER FLOOR		
	Grillage	Columns to	Floor Beams	Girders Bracing	Columns to	Floor Beams	Girders Bracing
Ordered							
Shipped							
On Job							
Start Erection							
Complete							

	TRACK FLOOR			ROOF		
	Columns to	Floor Beams	Girders Bracings	Columns to	Stack	Roof Trusses Purlins
Ordered						
Shipped						
On Job						
Start Erection						
Complete						

Table 1.—Outline of boiler house contract.

The form just considered will take care of the more important features of the work. The whole job is followed in detail by the inspector. It is the duty of this man to watch carefully the course of construction of the job for which he is responsible. He reports to the engineer of the company. He must check up the workmen of the contractor to make sure that they begin every part of the work correctly and that they continue without error to the end. He reports daily to the engineers by means of a written form as follows:—

The table is self-explanatory and well worth considering carefully. It was adopted after the abandonment of many other forms. It contains all the points of vital interest, and will prove of immense advantage in the checking of bills when the contract happens to be on the "time and material plus 10 per cent." plan.

In order to follow the progress of the work graphically a curve should be plotted, using the number of men at work per day multiplied by the average working hours per day as the ordinates, and the duration of the particular job, in days, as abscissae. The

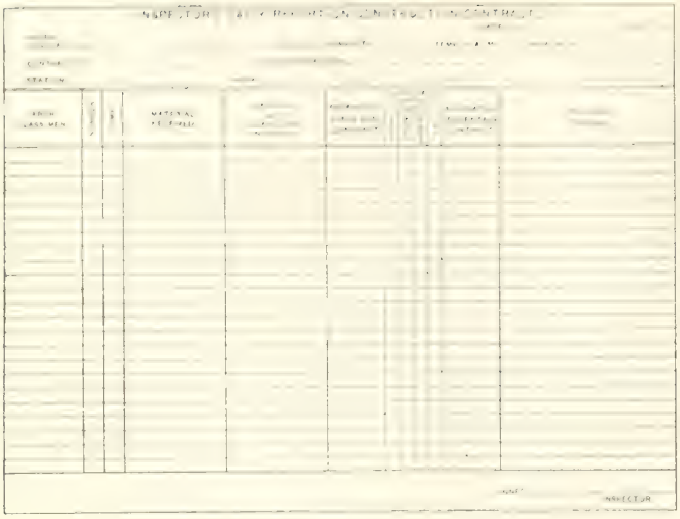
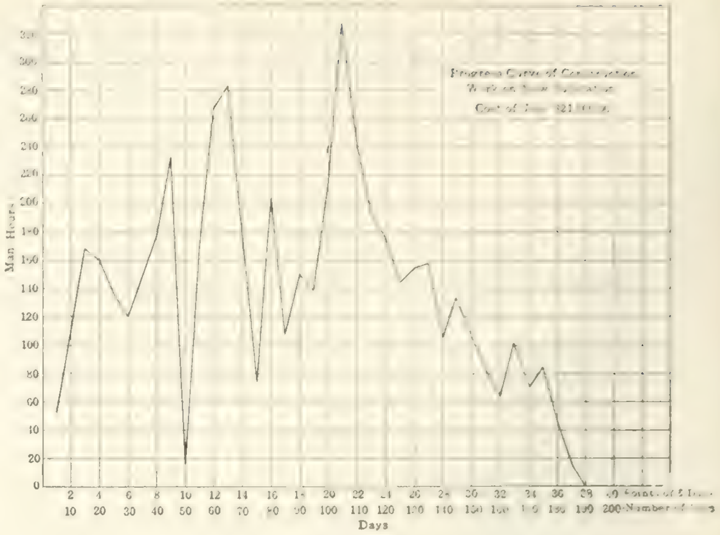

MATERIAL
INSPECTOR

Table 2—Inspector's report to engineer.



Curve Sheet 2—Poor handling of work on a power house contract.

man-hours represents a very good, though of course approximate measure of work performed. The completed curve shows where the work slacked and where it was pushed with vigor.

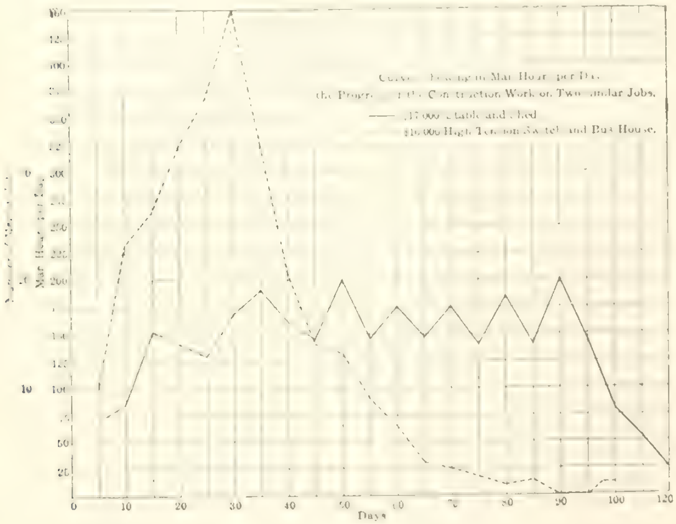
Curve sheet No. 1 is for the purpose of showing how two different contractors handle work of a similar character. The two jobs are contracts 105 and 106, mentioned under "Miscellaneous Building Jobs." The dashed curve with the high peak shows that this contractor pushed the job hard for the first thirty days, at which point he saw that he could complete the job with ease within the allotted time. Hence, he decreased his force, rapidly at first, but continually. From the sixty-fifth to the ninetieth day, the work was carried on in a desultory manner as the details were being cleaned up. The succeeding seven days were devoid of activity as the contractor believed the work to be completed. During this period the engineer made a thorough examination of the job and when he had finished, the unfinished items which he discovered required the attention of one man for two days.

The other curve shows that the contractor on the Stable and Shed contract had a different method of prosecuting his work. The amount of work performed increases during the first thirty days and then continues at a comparatively constant rate for the following sixty days, when it decreases uniformly to the completion of the work twenty days thereafter.

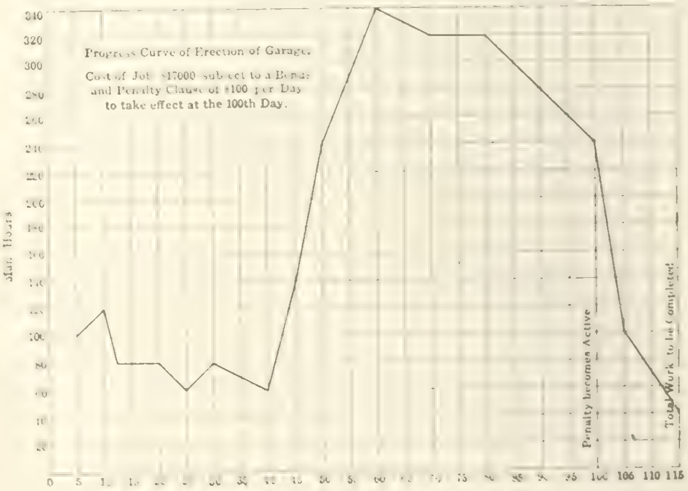
I have had a number of curves plotted for both of these contractors and find that the two just considered are their characteristic curves. The first begins his work with a dash, but soon cools down, when it becomes extremely difficult to push him. When this sort of man is performing work which it is desirable to complete at an early, or at least, on a certain date, it is well to provide a spur within the contract, such as a bonus and penalty clause. The other contractor comes up to speed more slowly, but holds it with greater constancy to the end.

The ideal curve for jobs of this character lasting approximately one hundred and ten days would rise with a gentle sweep to maximum at about the fortieth day, continue constant for twenty days, and then decline smoothly and constantly to completion. There are many factors which tend to make this impracticable, e.g., the non-arrival of certain material, unpropitious weather conditions, strikes, difficulty in obtaining labor, etc.

We will now examine the progress curve, Curve Sheet No. 2 of Contract No. 103 for the construction of a modern sub-station. It shows that the work was poorly handled. There are too many peaks and valleys to indicate connected and well directed effort.



Curve Sheet 1—Comparative performance of two contractors.



Curve Sheet 3—Progress of work under same contractor as Curve 3, but now working under a bonus and penalty clause.

This job required the expenditure of a large amount of nervous energy upon the part of the engineer in order to get it completed within a reasonable time.

The next curve shows this same contractor working under a bonus and penalty clause. The job is the erection of a garage to contain the electric automobile trucks of the company. The contract price was $17,000. The work was to be finished except for certain specified details representing about 8 per cent. of the total work, one hundred days from date of contract, the remaining work to be completed within fourteen days thereafter. The bonus and penalty clause stated that if this approximate 92 per cent. of the work should remain unfinished one hundred days from date of contract, a penalty of $100 per day would be required for each and every day thereafter until the terms of the contract were met, but a bonus of the same amount would be allowed for each and every day that the work required was satisfactorily finished prior to the specified time.

From Curve No. 3 it will be seen that the contractor did not appreciate the necessity of prosecuting the work with energy from the commencement. He dawdled along for the first forty days as he had been accustomed to do in the past. At the end of this period he suddenly realized that he had sixty days left in which to make good. The penalty became a reality that stared him in the face. This job had been let at a time when the contracting business was rather quiet, so that it had been bid pretty close. Every $100 counted, and he had no desire to pay a penalty if it could be prevented. He, therefore, increased his force rapidly and kept them up to speed and just managed to satisfy the engineer. He escaped the penalty, but received a valuable lesson, and it has been noticed that his characteristic curve has been somewhat improved by subsequent management.

The value of these curves will be evident to engineers or superintendents in charge of construction work. They not only serve as a mental picture of the progress of a certain job, but are also of value as a means of impressing the contractor with the way in which his work is managed.

Another curve may be plotted on the same sheet, if desired, showing the percentage of the job completed at the close of each day. These values are estimated by the inspectors on the job. Of course these percentages, being estimated, will be only approximate, but an experienced inspector can estimate the status of the work with reasonable accuracy.

The six contracts assumed in the early part of this article to be active in a certain company should all be followed up as suggested herein. If this be done, each job will be kept separate and distinct and the features of each may be examined on demand. As before stated, this system has been thoroughly tried out and found efficient and valuable under the conditions of practical construction. Engineering Magazine.

Brick An Ideal Architectural Material

CONSIDERED from the view-point of beauty, brick would seem to occupy a unique position among the structural materials available for the creation of beautiful buildings.

Brick is made in reasonable small units, so that in the case of many modern buildings, at least 100,000 of them show on the exterior. This, together with the varying shapes and sizes obtainable, make possible an almost infinite variety of form and pattern, thus giving full scope to the imagination, ingenuity and skill both of the designer and the workman.

Brick, moreover, is now made in almost every conceivable color and shade, the permanency of which is unequalled by hardly any other building material; with such a "palette," therefore, at one's command, and by a skilful use of color, the brick builder of today can readily add to his design that living touch which the painter gives us in his painting.

Brick may also be counted unique in the fact that it requires for its structural efficiency the use of a very considerable amount of material of quite another kind and color, namely, mortar; and, further, that this material must of necessity show in the form of a joint to a more or less degree in the face of the finished wall. A mistaken idea has prevailed that the mortar joint is a blemish that should be suppressed as far as possible, or be colored to match the brick. We find, however, that the designer of to-day seizes the very opportunity afforded by a mortar joint to introduce into his wall another element of color and pattern.

The word "texture" has lately come into use in connection with brickwork, and, strange to say, this word has a very pausible application, for the builder of interesting brick work has much in common with the weaver at the loom as far as resulting color effect goes. Just as the weaver, with his threads of varying sizes and colors produces a never-ending variety of useful and beautiful fabrics, just so it is possible for the brick builder, with his bricks and joints of many colors and sizes, to weave new ideas and combinations in his work, all in beautiful and imperishable patterns; and this applies to all brick.

Just as the fabric charms and delights the eye, and at the same time protects men from heat and cold, and performs a thousand other useful functions, so the beautiful way of brick, exemplifying man's ingenuity and his artistic skill, forms also the protective structure of the buildings erected for his use. Brick, therefore, would seem to fulfill to a very high degree the requirements of an ideal architectural material.

The Harrisburg filter plant made a new high record for bacterial removal during 1912; the average efficiency for the year was 99.97 per cent. The Susquehanna River water contained, on the average, 5,300 bacteria per cubic centimeter, while the treated water showed average counts of only 2. The operating expenses, at the plant, which includes coagulating basins, rapid filters and hypochlorite apparatus, were as follows, per million gallons of water treated: Coagulant, $1.35; coal, 36 cents; supplies, 42 cents; repairs, 52 cents; oil and waste, .05 cents; chemist and laboratory, 37 cents; salaries, $2.46; total, $5.53. The fixed charges for interest and sinking fund and state tax on the filtration loan was $6.94 per million gallons. The operation of the filtration plant is in charge of Mr. George G. Kennedy, Mr. James M. Caird has served as chemist and bacteriologist.

Magnificent New Hotel for Edmonton

Nine-Storey Building Designed in the Old French Chateau Style for the G. T. P. Development Company — Steel and Concrete Construction

THE MacDonald Hotel, at Edmonton, Alta., is to be located on a beautiful site overlooking the river and at the same time only a few steps from the business and shopping centres and convenient to the railway stations.

The hotel will be built of Canadian granite and buff limestone in the style of the old French chateaux of Normandy and Touraine—a style particularly appropriate to its location on the bluff above the river. Its height of nine storeys, surmounted by a steep, picturesque roof, will make it a landmark to be seen for miles along the river valley, as well as from all parts of the city itself.

There will be more than two hundred sleeping chambers provided, with separate private bath-rooms and telephones, and the building will be equipped with every approved modern appointment.

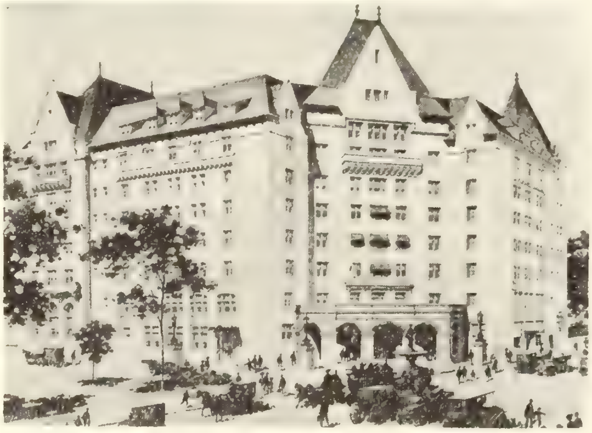
The hotel has its main entrance on McDougall Street, just a step away from the busy corner of Jasper Avenue, so located as to be most convenient of access, yet just away from the noise of the crowded corner.

One enters off the street into a little open courtyard and the entrance loggia and through the revolving doors into the spacious rotunda. From the rotunda one catches enticing glimpses of the lounge and the palm room and of the corridors leading to the dining room, cafe and bar, while the office, telephone and telegraph rooms and the elevators are easy of access and can be found at once. A separate entrance provided for ladies, leads first to the ladies' reception room and then to the corridor directly in front of the ladies' elevator and adjacent to the palm room, without passing through the rotunda.

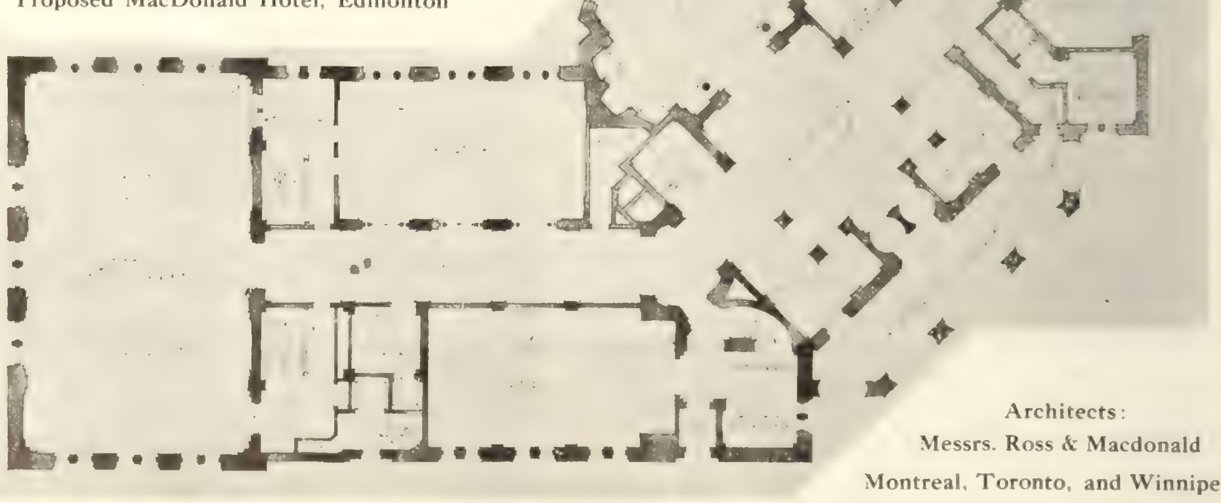
A feature of this floor is the octagonal palm room, free from all columns, with richly decorated ceilings and lighted on all sides by great windows.

Another interesting feature is the large comfortable lounge room immediately off the rotunda, with its great fireplace and its broad elliptical bay window, affording a magnificent view of the river and surrounding country.

From the rotunda the grand staircase of marble and bronze conducts to the mezzanine gallery and foyer, from which one can watch the busy life of the rotunda without participating in it, and from which



Proposed MacDonald Hotel, Edmonton



Ground Floor Plan

Architects:
Messrs. Ross & Macdonald
Montreal, Toronto, and Winnipeg

lead the drawing rooms, ladies' gallery and banquet rooms.

Above the mezzanine floor rise tiers of sleeping rooms and private parlors, reached by means of wide, spacious staircases and elevators, each one with a magnificent outlook over the city and the river. There is not a dark or uninviting chamber in the entire building, and comfort and spaciousness have not been sacrificed to secure a maximum of accommodation. Large closets have been provided in every room.

Not the least desirable feature about this hotel is the fact that it is to be absolutely fireproof, every precaution having been taken to attain this, regardless of cost. All the structural parts are steel and concrete, and the partitions of terra cotta. The floors are of cement and marble and the staircases marble and iron.

With all these precautions fire escapes would seem to be unnecessary, yet these have not been neglected, ample provision having been made for them in several parts of the building, so as to be easily and quickly reached from every room.

The same careful attention has been given to the sanitation of the hotel. All of the bath rooms are models of cleanliness and healthfulness, with porcelain fixtures and tile floors and walls of exquisite design. The bath rooms are all well ventilated, eighty per cent. being outside rooms lighted by actual windows.

The architects are Messrs. Ross & Macdonald, of Montreal, Toronto and Winnipeg.

The Design and Supervision of Construction of Low-Truss Steel Highway Bridges[†]

By G. M. Braune[*]

THE plans for small country highway bridges are usually made by bridge company agents, and experience proves that the majority of county commissioners will accept most any plan so long as the price is low enough. A great number of these bridges are indeed doing service to-day for ordinary light traffic, but should the members be stressed up to the amount for which they were "designed" the chances are that they will refuse to carry the loads. The peculiar thing about the situation is, moreover, that the collapse of such structures, and even the publication of these occurrences, seems to have small effect upon the future construction of similar structures.

The writer has knowledge of the collapse of a bridge built in one of the Southern States some years ago. The top chord was made of two angles and a web plate, in the form of a T-section. In this case, however, the bridge had been accepted by the county commissioners, and it was not until a few days after the acceptance that it collapsed under a drove of horses.

Precautions When Using a Heavy Concrete Floor

Concrete floors are rapidly replacing the former light wooden floors; therefore the actual dead-load stresses occurring in the bridge members are a large percentage of the maximum computed stresses, and the details are seldom designed to properly take care of these large actually occurring stresses. The design of the details is too often turned over to a young, inexperienced draftsman, whose knowledge about the distribution of stresses is generally somewhat meager.

Not very long ago the writer was shown the shop drawings for a 75-ft. pony truss "designed" to carry a heavy concrete floor. A splice of the bottom chord (made of $\frac{5}{8}$-in. material) was attempted at one of the lower panel points, and the draftsman had intentionally, although ignorantly, neglected to provide sufficient splice material to equal the area of the cut chord. The correct number of rivets had, however, been provided to take care of the stresses in the different members that were attached to the $\frac{3}{8}$-in. gusset plates. When the error was called to the draftsman's attention, he was much surprised, and informed the writer, "that was their usual method of designing splices." Luckily the bridge had not been shipped, and the corrections were made in the shop.

Since heavy concrete floors have come into fashion, resulting in large dead-loads and large reactions, it is very essential that the ends of the trusses should be provided with pin bearings, although this detail is to a great extent ignored, not only by a number of bridge companies, but also in some of the recent textbooks. Owing to the uneven distribution of the reaction over the bearing plate, large secondary stresses will occur in the members designed to take only direct stress.

The writer is personally acquainted with an accident which happened some years ago to a heavy low-truss bridge in which this detail was omitted. As the bridge was not provided with end-pin bearings, large bending moments occurred in the bottom chord, and also, of course, in other members of the truss. One day, when a heavy electric car was crossing the bridge, the bottom chord parted near the end-panel point. Computations showed that the member was carrying a conservative direct working stress; and faulty material was not the cause of the failure as was shown by subsequent tests.

Low-truss bridges, 100 ft. long and over, have been constructed in Europe and in this country, which, from a standpoint of strength, stiffness and aesthetics are all that could be desired. The computations of the stresses, makeup of the sections, and the design of the equally important details, require, and always will require, however, a certain amount of intelligence and experience.

Points About Some of the Details

The lateral forces acting upon the top chord of a low-truss bridge, whether from external causes, or resulting from column action, can be cared for without the addition of unsightly floor-beam knee-braces by designing the vertical posts or diagonals of a form (say, two angles and a web plate, or if the design requires it, four angles and a plate) capable of resisting bending and shear. The overturning effect of the lateral forces can then be transferred into the floor-beams by riveting the vertical posts to the floor-beam web, or through the diagonals into the gusset plates, and thence by means of a diaphragm, into the floor-beams.

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[†] Abstracted from an article in The Engineering News

The bending moment in the verticals and diagonals, and hence the resulting indirect shearing action on the rivet connections, would be obtained by multiplying the assumed lateral force by the distance between the center line of the top chord (position of application of lateral forces) and the center of the group of rivets connecting the floor-beam to the vertical posts. The rivet connections should be sufficiently strong to take care of direct shear and also the shearing action resulting from the bending in the posts and diagonals.

The top chord should be of an inverted trough section, sufficiently wide to allow the vertical posts and diagonals to be inserted between the gusset plates. Pin-connected pony trusses should not be tolerated.

Supervision of Construction

As long as intelligent supervision is not had over the design and construction of highway bridges, we will hear of occasional collapses; and there will also occur numerous failures which will not be brought to the notice of the engineering profession.

The question before us is, how can an improvement of this state of affairs be brought about? Some engineers honestly believe that by licensing the practice of engineering good results could be secured in this direction; others hold, however, that this would not overcome the evil, on the other hand, it might make matters worse; for an engineer holding a license would be per se in the eyes of a great many county commissioners a competent bridge engineer, whereas we all know that this would not be the case.

Mackenzie and Mann Builders of a Transcontinental Railway

By Robson Black

THE obvious suggestion in the mention of "Mackenzie and Mann" is that Scotland is in the offing. In Canada, where forty of their years have focussed on the building of a transcontinental railway, coaxing away franchise, and piping power from Niagara Falls for the biggest kilowatt combine in the British Empire, most of the pioneer jobs have been done by transplanted Covenanters.

In the United States, it is not unusual to find half-a-dozen contesting for the credit of the nation's growth—but in Canada the annual reunions of Lowlander and Highlander settle that point.

The story of Sir William Mackenzie and Sir Donald Mann, and how they have epitomized the strongest characteristics of their race in a two-person alliance, has not hitherto been segregated from the other and more matter-of-fact story of geographical victories through railway building.

While other men have written their isolated chapters in the serial of a national railway system, Mackenzie and Mann in their own unaided strength carried their lines from handicapped birth through troublesome childhood to truly stupendous maturity.

From the day they stood together on a Manitoba hillock and glanced over the infinite monotony of half-bleached prairie-grass, on through forty years of planning and perfecting, they have interlaced the Dominion with speeding trains that bind the grainfields to the seaboard and criss-cross from north to south with more than six thousand miles of steel.

The past contains no such picturesque proof of the possibilities of one span of life, a single brain, one pair of hands, as the building of the great railways of the American continent. For gigantic daring, quixotic faith and uncanny resourcefulness, the tale of the construction of a transcontinental railway system over a vacant wilderness of brown lands and swollen rivers constitutes a sort of Robinson Crusoe in commercial fiction.

The partnership of Sir William Mackenzie and Sir Donald Mann, who only a while back passed beneath the gilding-machine of knighthood, has won distinction for a reason rather unique. Not only have a schoolmaster and lumber-jack built and equipped the Canadian Northern Railway in the face of the bitterest adversity, but they still own it.

Usually, the story of big American railways has contained two chapters: one written by the pioneer, the builder, the man with the idea; the other penned more delicately by the financial diplomatist who reaped where his brother had planted.

Who of the human stream passing into the great railway depots of New York City or San Francisco could tell you the builder of the Southern Pacific or the New York Central? But wherever there is a tongue to speak in East or West Canada, the names of "Mackenzie and Mann" are the ready answer to the question of who created the Canadian Northern.

It is a pleasing equation: two Scots, "Bill" and his comrade, "Dan;" the one weary of birching schoolboys; the other sick of a timber limit and dreaming of a continent; unknown to either, they struck for the heart of the prairies, took up small contracting, then pushed onward, still in their isolated trails, until "big business" cast both men near Kicking Horse Lake, an effervescent construction camp at the foothills of the Rockies.

Donald Daniel Mann, seeking a new load of grub for his navvies five miles back country, went townward.

Along the same trail he spied a lean and sinewy figure in a coarse suit and prospectors' fatigue boots that harmonized with the rough duties of William Mackenzie. Mann sharpened his pace. The sound of his mighty steps made the first traveller glance backward; his gait slackened. When the big fellow caught up with him he turned and nodded. The other nodded too.

"Going for grub," admitted Bill.

"Same here," sympathized Dan.

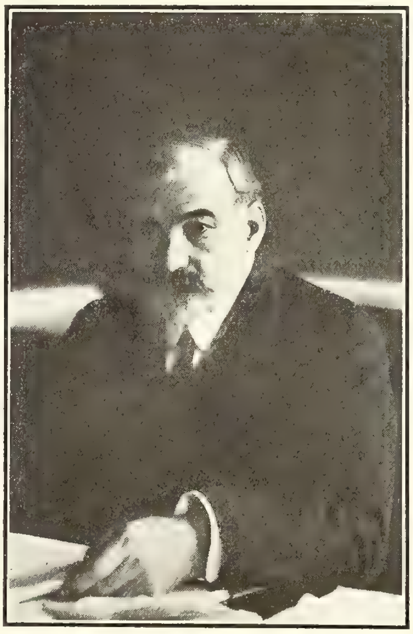
That was the first meeting of Mackenzie and Mann. It was some years afterward that an actual partnership came about with a contract for a small Western railway as their first giants' menu; but there is little doubt that in the stroll to Kicking Horse town some keen and stealthy analysis of each other's strength was paving the way for one of the finest business coalitions ever known.

Mackenzie is commonly spoken of in exaggerated terms; but he is neither wizard, alchemist nor goblin. He attains his marvellous ends after the manner of men and the works of men. He is perfectly normal flesh and blood—not much more than five feet of it, either.

His journeyings here and there, his positive delight in brewing a mystery, his cautious radicalism, his calculating method in transactions, are those, perhaps, of a hundred other heads of great organizations across the face of the financial world. He is in every detail a business scientist. His lieutenants are usually treated with large salaries and scant sentiment.

He does not assume to be his brother's keeper, but on no account must that attitude be presumed by others. He has all the crisp, curt ruthlessness of a Napoleon applied to the warfare of elevated finance; nor had the Little Corporal a finer fund of persistence, economy of effort, swift perception, self-control, or more absolute judgment of his fellow-men as productive or non-productive units in some high-efficiency grist-mill.

Sir Wm. Mackenzie.



Sir Donald Mann.

A short while ago his solicitor appeared before a commission of the Federal Government at Ottawa. Finding it necessary to explain to the members of Parliament his personal anxiety to obtain a charter from one place to another in the west of Canada, the lawyer remarked frankly: "Gentlemen, this is no picnic for me, I assure you. One day Sir William drops into my office. 'We are going to run a line between these two towns,' says he, throwing down a map. Then I try to tell him I have no charter. 'Well, why in blazes haven't you?" That's all. So I pack my grip and come down here," ended the lawyer.

That is Mackenzie through and through. He demands precisely as much thought, care, courage, cunning and patience as he in his own person would give. When it is not forthcoming there is usually a row, and the office boy salutes a new boss o' mornings.

If the writer were called upon to denote one outstanding distinction in Mackenzie it would be a healthy Celtic-Saxon propensity for a personal conflict, an inborn appetite for "fight." Not that he is stubborn; his nature is intensely virile but refined; his expression has an attractive calmness, dignity, and an air of kindliness. Yet hidden in a pair of eyes totally inscrutable through a veil of shadows of deceiving texture is the impatient spirit of a consistent victor who refuses to scent defeat.

Mackenzie is not of the opulent, supervain or covetous sort either, for his threescore years have been a very real contribution to the book of Canadian and British progress. By convenience a citizen of Toronto, he is by choice and in the natural channels of his genius an international trader in capital and dividends and a much more productive Empire-builder—if less picturesque and poetic—than his elder brother, the African Rhodes.

The ascent of a pair of Canadian youths into the orbit of the world's mightiest was no combination of lucky accidents. They have done what they have done as regularly as (if more radically than) the system of British banks from which they draw their bags of millions—and, so far from being assisted or propelled by the money or the goodwill of other Canadian railway interests, their London flotations have been forced through often in the teeth of atrocious rumors and other malignant bearish influences.

A little while back, out of the scrapheap of vague newspaper gossip and street-corner speculation about the city of Montreal burst a dazzling story bearing the official stamp of Mackenzie and Mann.

The whole city stood in amazement; the Grand Trunk and Canadian Pacific Railway companies tried to smother their disappointment in a show of incredulity.

By this time the deed of that day has passed across the tongue of Canada—how the Canadian Pacific and the Grand Trunk held the metropolis of Canada as a jealous monopoly, scorning the efforts of the Canadian Northern to enter the city by any known route. To purchase an entry to Montreal would have required more cash than could have paid a return. And that was flawless logic—in so far as conservative vision could embrace the situation.

At the back of the city loomed a high and thickly-wooded hill called Mount Royal, which effectually confined the flow of traffic and the spread of population to the comparatively narrow strip between its base and the curve of the St. Lawrence River. To the farther side of the barrier lay an area of cheap land, rendered so through the indirectness of its street railway facilities.

I believe the idea struck "Dan" first. "Bill' went down to look it over. Then silence—long, exasperating lull, during which only the drip, drip, of a brimful newspaper story coursed through the daily columns. But it spilled at last, right to the dregs.

And the country read that day how Mackenzie and Mann had secretly purchased seven miles of dirt-cheap land back of the mountain—how they were to drive their railway into the heart of Montreal by tunnelling the base of the hill; how the direct route thereby effected would send the value of the land-purchase into thirty millions of profit by creating a new residential district within a few minutes' trolley ride of the heart of the metropolis; how the brilliant engineering coup would take away the back-breaking burden of the tunnel's cost, pay for the terminals, and leave a long line of money-bags as a surplus for the company's treasury.

Sir Donald Mann is the unsung genius of the Canadian Northern combination. He receives few deputations; he seldom makes comments to the Press; he is not the social ambassador of the system by any action or pretence; only recently has he bothered much with the political life of the western provinces or the Federal government.

When people call round who talk too long or too circuitously, "Dan" blows a bombshell of cigar smoke half way across his room, and on occasions has been known to mutter big declamatory things that roll and rumble like a fretful tempest in the foothills.

"Dan" Mann is deep-chested, solemn-eyed and reflective. A closely-trimmed beard does its best to soften the lines of a Samson's face, and in these latter days, with the increasing strokes of grey, the shadows are meeting the high-lights upon a more amicable understanding. The head is set solid; its lines are not in the least degree apologetic; the eye is the master's eye; the voice is the channel of muscular words—some little flash of sunshine once in a long time—but usually his contact with his fellowmen brings up the more austere reflections of the Nature he has known with an imperial intimacy.

His physical strength has been titanic. Once, while still a boy on his father's humble farm near Acton, Ont., he set off for town with a wagonload of garden truck. He had little difficulty in disposing of his stock, and found himself with several hours of idleness before the time of his return.

His stroll brought him to the town commons, where the athletes of several counties were testing their skill at an annual tournament of sports. Young Daniel hung about the crowd for a while, then, unable to restrain his spirits, threw off his coat and entered his name in practically every event, from throwing the discus to wrestling, boxing and running.

When he hitched up the team for home that night he was richer by forty dollars of cash and a china tea-set.

That physical dominance was in his case the complement of a massively-formed intelligence. And it struck it roots with as much dissimilarity from his comrade Mackenzie as Cromwell showed from Cardinal Mazarin.

Beauty and Utility in the Skyscraper

IN St. Louis what is styled "the world's largest business building" is about to be opened. It has twenty-one storeys, with an area of 65,000 square feet for each floor. It is light and airy, and evidently well constructed, and no doubt it is in all particulars adequate to the commercial uses to which it will be put. But it is abominably ugly, comments the Philadelphia Ledger. Its plan is uncompromisingly, pitilessly rectangular and rigid. Each facade presents the appearance of an enormous vertical cucumber frame of multitudinous windows. There is not a single visible attempt at adornment, not a curvilinear effect of any sort to relieve the rows and rows of squares and oblongs and gaunt upright parallels.

By way of striking contrast, take the new Woolworth building, which dominates Manhattan Island with an upsoaring shaft of stone that answers to Mme. de Stael's famous definition of architecture as frozen music. This is a building at once useful and beautiful. It nobly asserts above Broadway its spiritual inspiration, just as Trinity church stands at the head of the rush and roar of Wall street like a perpetual minaret and muezzin call. When such results are feasible, what is the excuse for uglifying a downtown city block with the hideous angularity of such a structure as that upreared in the metropolis of the Mississippi valley?

In every American city to-day there are increasingly abundant examples of the way to build great houses of business that blend the practical and the inspirational values. Philadelphia has a goodly proportion of such ornamental edifices, in which thought was altruistically taken for the improvement of an entire neighborhood. In time, with the contagion of taste and esthetic education, the "cloud-scratching" monstrosity will be an abomination of the past.

Organization, co-ordination, co-operation, are the right of every body of men whose aims are worthy and equitable and must needs be the resource of those who individually are unable to persuade their fellowmen to recognize the justice of their claims and principles. If employed within lawful and peaceful limits it may rightly hope to be a means of educating society in a spirit of fairness and the practical brotherhood.—Bishop Potter.

Canada is the world's chief source of supply of asbestos. According to the preliminary returns, Canada's output of asbestos in 1912 exceeded that of 1911 by at least five per cent. The output was 97,816 tons, the sales 106,520 tons, valued at $2,959,677, or an average of $27.79 per ton, and the stock on hand at the end of the year 21,686 tons, valued at $1,021,066. The record indicates an increase in sales and reduction of stocks on hand. The exports during the year 1912 were 88,008 tons, valued at $2,349,353, as against 75,120 tons, valued at $2,067,259, in 1911.

Methods of Purifying Water in the Household, with Some Costs

THE methods available for the purification of water in residences are of interest to water works men and engineers who are frequently asked to recommend a type of water purification plant for residences not served by a pure public supply of water. Experiments, which have been conducted in the laboratories of some of the engineering colleges, indicate that certain forms of household water purification plants now on the market are of no value. Some of these devices are worse than useless since they give a feeling of security to the water user, yet do not remove bacteria. In a recent paper before the Iowa Engineering Society on the Purification of Water for Residences, Mr. J. H. Dunlap, Assistant Professor of Hydraulics and Sanitary Engineering at the State University of Iowa, discussed the various types of household filters now on the market in a very frank manner. Portions of the paper abstracted and quoted by Engineering and Contracting are given below.

The following methods of purifying water in the residence will be discussed: (1) by chemicals; (2) by electricity; (3) by heat; (4) by filtration.

Purification by Chemicals.—Hypochlorite of lime has proven itself a valuable germicide. Experiments with chlorine itself seem to point to a new process that will do away with the difficulties of using the customary bleaching powder and with the consequent formation of sludge. For comparatively large amounts in institutions, engineering camps, etc., hypochlorite of lime has a field. For the ordinary householder, however, it is out of the question.

Purification by Electricity.—Electric current may be used in household water purification, either in the ozone process or in the ultra violet ray process. Ozonizers have been greatly improved in the past ten years. In 1890 the Berthelot ozonizer produced one gram of ozone per kilowatt hour, as against 215 grams from the Meeker ozonizer in 1911. In this country household air ozonizers are on the market. Abroad household water ozonizers are coming into use. The first cost of one good type is about $40. Wherever electric current is available it is a convenient method, for the full output of the tap may be depended upon to be sterilized and well aerated. In Europe last year about $7,000,000 worth of business was transacted in ozone apparatus. Future development in this country is bound to be rapid. As for the ultra violet ray process it is already used considerably abroad. In this country it is likely to be used more in the near future. In France small household apparatus is available. The North Railway Company of France is reported to have adopted this process for sterilizing the water supplied in its stations. The common method of producing the rays is by a Cooper-Hewitt mercury vapor lamp, using a quartz tube.

The process thus far described, while not in actual use to any great extent in this country, are mentioned in order to indicate what direction the future course of events is likely to follow.

Purification by Heat.—Boiling impure water is of course the most common way to kill the bacterial content. Many people erroneously suppose that it is necessary to boil the water for 15 minutes or even half an hour. As a matter of fact the heat will have done its work as soon as all the water has reached 212 degrees F. Since individuals differ in the standard used for determining when the water is boiling, it is customary to advise boiling for five minutes. This is an extremely expensive and laborious method as ordinarily done. The Forbes Water Sterilizer solves the problem.

This sterilizer is so made, that although it boils every particle of water for a few seconds, it does not render the water unpalatable. Water is discharged continuously at nearly its original temperature, having given up its heat to the incoming supply. It costs in the household size, about $25. The capacity of this size is 2 gals. per hour. Capacities up to 500,000 gals. per hour are advertised. Any heat source may be used, steam, electricity, gas, kerosene, or alcohol. One foot of gas is said to sterilize one gallon of water, which shows it to be very economical in operation.

The two sanitary drawbacks to such an apparatus, or to boiling in general, are first: that a turbid water is not clarified; second, that the vegetative forms of bacteria are not destroyed. The spores remain. Now abroad several types of apparatus are in use for boiling water under pressure at a temperature of 115 deg. to 120 deg. C., which will destroy the spores. Until it is more clearly proven than at present, that the usual spore forming bacteria are harmful, such apparatus will not come into general use in this country. Some recent studies of the spore forming bacteria found in water have been made, but further investigation along this line is needed.

Purification by Filtration.—The other draw-back of boiling, the lack of removal of turbidity and suspended organic matter, can be overcome only by filtration. If all the water for the house is to be filtered, and the water is under the pressure of a town supply, rapid filtration may be used. Many companies are manufacturing pressure rapid filters in household sizes ready for installation by any plumber. Whenever the water needs preliminary coagulation, an automatic alum feed is provided.

The New York Continental Jewell Filtration Company charges $100 for its 12-in. New York House Pressure Filter. The capacity of this filter is 2 gals. per minute. Hence no householder need use turbid or highly-colored water, even though the community in which he lives cannot provide better. The bacterial efficiency of this type of filter, considering the conditions under which it is run, is probably not over 75 per cent. Hence subsequent sterilization is necessary for water used in drinking and in cooking, and may be accomplished either by heat or by certain kinds of filters to be described later. The filtering medium of the New York type is ordinarily sand. The water passes downward through the sand, through the strainers at the bottom, and then to the tap. Once a day the flow is reversed and the rakes are revolved by turning the handle at the top. The water and the revolving rakes thoroughly churn up the sand, and the dirt and many of the bacteria are flushed out. If two filters are used, water filtered by one may be used for washing the other. Alum in solution is held in a coagulant tank, A few pounds of alum will last for days, 1 lb. being said to be sufficient for 7,000 gals. of water.

One way of purifying small amounts of water is by means of a home made slow sand filter. One of these little filters was in successful use at Dartmouth College for 15 years. It consisted of two vitrified tile pipes, 10 ins. in diameter, the upper one filled with sand of the proper size, with a few pebbles directly above the cement slab bottom. Through a small hole in the center of this slab the filtered water dripped into the lower tile, which thus served as a reservoir. Such a filter will cost about $8.

Sterilizing either turbid or clear water for drinking and cooking purposes may be done by a Pasteur-Chamberland household filter, manufactured by the Pasteur-Chamberland Filter Company, Dayton, Ohio, or by a Berkefeld household filter, manufactured by the Berkefeld Filter Company, New York City. Either type will cost about $6 in the smallest size convenient for an average household. The Pasteur-Chamberland filtering medium is unglazed porcelain. It was developed by the eminent French scientist, Louis Pasteur, and his assistant, Chamberland. The hollow filtering tubes are commonly called candles, because of their shape. They are made in France and are all of one size. The capacity of a single candle, with average water, is about one quart per hour when under 40 lbs. pressure. Any number of candles may be placed inside of one case when larger capacities are needed. They may be used anywhere by anyone, both gravity and pressure types being manufactured. Due to the slow rate of filtration a storage reservoir is convenient. The raw water surrounds the outside of the candle and slowly passes through its walls into the interior, leaving the bacteria and the dirt in the pores of the candle.

The Berkefeld candle is made of diatomaceous earth. The candles are made in different sizes. For large capacities any desired number may be placed inside the same case. In the smallest size the rate of filtration, under 40 lbs. pressure, is about 40 quarts per hour, as against the one quart per hour from the Pasteur. The Berkefeld, like the Pasteur, is made in many forms for water under both pressure and gravity conditions. The higher rate of filtration of the Berkefeld obviates the necessity for a storage reservoir, though this may add to its convenience at times

Another filter that will sterilize water is the Woolworth, manufactured by James G. Woolworth, Providence, R. I. During a period of 1 year and 46 days Professor Frederick P. Gorham of Brown University made 40 tests of the effluent from this filter and found it unfailingly sterile. The filter candle differs from all others in use of a mantle of aluminium hydroxide, bound together by mineral wool, supported on a porous earthenware tube. At present it is not upon the general market. In Providence and New York it is finding considerable use. To prevent neglect of the filters by the householder, it is the custom to lease them at $1 per month. With the lease goes a system of regular inspection and renewal of the candles, the average life of which is five months. Although Providence began filtration of its water supply several years ago, the demand for the Woolworth pure water service is said not to have lessened.

Of course there are many other kinds of household filters. Since most, if not all, of them are worthless, certain principles should be observed in making a selection. First, the value of a filter in general is in inverse ratio to its rate of filtration. Any filter that is to yield a sterile effluent, and that filters more rapidly than the Berkefeld, is to be looked upon with suspicion. This rules out the common cheap types. Second, natural stone filters of all classes and descriptions are to be avoided. A filter of this type costs nearly as much as the ones recommended, and can never be depended upon.

In order to test the natural stone type against the Berkefeld and the Pasteur, some experiments were recently made by the author, assisted by Dr. Arthur C. Grover of the Department of Pathology and Bacteriology of the State University of Iowa. Now according to the manufacturers, these stone filters do not need sterilizing, all of the impurities being said to be caught upon the surface, whence they may be easily brushed off to prevent clogging. Experiments, however, prove, as might be anticipated, that bacteria readily grow through the pores of the stone. Two types of bacteria were applied at different times, the Bacillus ruber de Kiel and the Bacillus coli communis. The effluents were plated on the usual media. The stone filters tested were of three different makes. After a run of 24 hours the effluents from all of the stone filters tested were of three different makes. After a run of 24 hours the effluents from all of the stone filters showed considerable contamination. After a run of one to five days the effluents ranged from about 1,000 to 10,000 bacteria per c. c. Of coures, the fact that certain types of bacteria, when applied in a solution containing millions per cubic centimeter, are able to pass through these stone filters in so short a time, does not prove that the typhoid germ, when present in the raw water in the usual numbers, would do so as easily. But the uncertainty renders stone filters worthless, if a sterile effluent is desired. They are very successful in removing turbidity, but not bacteria.

The tests on the Berkefeld and Pasteur filters lead to the belief that these filters will yield a safe effluent if sterilized daily. This should be done at a regular time each day, so that it will not be forgotten. Boiling the candles for about five minutes will suffice, together with all the surfaces that come into contact with the filtered water. For this requirement the construction of the Berkefeld is admirable. It will be convenient to have two candles, one to be in use while the other is being sterilized. Too much emphasis cannot be placed upon the necessity for frequent, regular sterilization of these types of filters. Unless the householder can attend to this himself, or has someone who can be trusted to attend to it, the filters should not be used. Boiling the water is in such a case the only resort. The question of how frequently the filters should be sterilized is one upon which difference of opinion exists. Some authorities advise boiling once a week. Others agree with the recommendation above, that daily boiling is necessary for absolute safety. It seems to be true that the bacteria grow through these filters. They do not pass through at once. But in the course of two or three days may succeed in developing in the pores of the filter walls, and in this way appear finally in the effluent. The rate of growth increases with increase in the temperature of the water, and is independent of the pressure of the water at the tap.

From the foregoing considerations the following summary must be given of household apparatus available for water purification. The Forbes Sterilizer is a most practical device for boiling. For water containing an objectionable amount of suspended matter, rapid or slow filtration with the household types is necessary. For subsequent sterilization either boiling or filtration by the Pasteur-Chamberland or the Berkefeld filters is possible, remembering to sterilize these filters daily.

The Bacterial Clarification of Sewage

It will hardly be disputed that the most costly part of a modern sewage works, certainly in capital expenditure and often in revenue charges, is the filtration area. Just as the difficulty of land treatment of the sewage of large cities forced on the consideration of more compact processes, so these in their turn are becoming impracticable when great centres of population have to be considered. This conclusion was impressed upon the senior author of this paper when called upon recently to report on the proposals of the Metropolitan Sewerage Commission of New York for the disposal of the sewage of that city. This conclusion was shared by his colleague, Mr. J. D. Watson, who reported simultaneously from an engineering point of view.

The area and cost of filter-beds depends mainly, it will be found, on the amount of colloidal matter present in the sewage, and much confusion of ideas is probably due to the fact that the ordinary sewage filter, be it contact or trickling, is called upon to do two entirely different things at the same time—viz., on the one hand to oxidise, granulate, and finally discharge as humus the colloidal matters present, and on the other to oxidise and nitrify substances in true solution.

A very open grade deep filter is best suited for the first purpose, a shallow fine-grained filter is the most economical for the second. It is true, as Dr. Reid has shown in the Potteries, that a tank effluent well clarified by sedimentation can, by accurate distribution, be very efficiently purified on filters of fine material, but even then the area and cost involved when exceptionally large works are under consideration make the problem a very serious one. For these and other reasons the thoughts of many workers in sewage treatment have been turned to the possibility of more efficient removal of colloidal matter before the filtration process.

Hitherto almost the only practical method has been heavy chemical precipitation. The cost and difficulty of this process when really efficiently carried out (and it should be emphasised that a mere prefunctory addition of a few grains per gallon of precipitant is money thrown away) become very great as the volume of sewage increases. Not only are enormous quantities of chemicals necessary, but the disposal of the vast volume of resultant sludge, without menace in some way to the community, becomes increasingly difficult and costly.

Method of Obtaining Clarified Effluent

The thought which has been in the minds of the authors of the present paper has been to find a method of obtaining a thoroughly clarified effluent without the use of large quantities of chemicals and with the minimum production of sludge. By a thoroughly clarified effluent is meant one which will not eventually deposit solid matter either on the bottom of a stream into which it flows or in the interstices of a bacterial filter. It is clear that in a sewage filter a combined oxidation and coagulation of the colloidal matter must go on, resulting in the production of the so-called residual humus, which either is collected in humus tanks or is periodically washed out of the medium. If this oxidising and coagulating process could be brought about by suitable open tank treatment before the filtration process, it is obvious that the latter could be enormously accelerated, if not dispensed with altogether, and the whole operation of sewage treatment could be conducted on a much smaller area.

In the course of a research on another matter, one of the authors had occasion to study the reactions of an organism occurring in Nature in pit water impregnated with iron. This organism, which for convenience has been designated B7, is a true facultative organism, preferably an aerobe, and exercises a specific action on iron solutions.

The action of the bacillus on iron solutions proceeds in two stages, in which the aerobic and anaerobic actions appear to be symbiotic, at any rate under the conditions occurring in Nature. The aerobic action is to precipitate ferric hydroxide from iron solutions, while the anaerobic action is to transform the hydroxide thus precipitated into bog ore, with partial reduction of the iron to a ferrous state. It was found that in order to precipitate the iron sufficiently the organism required a certain proportion of albuminoid organic matter. It was therefore natural to expect that ordinary sewage matter could be utilised in this way. Experiment, in fact, showed that a sewage effluent could be effectively clarified in this way when acted upon by this organism in presence of small quantities of ferric salts, aerobic salts, aerobic conditions being maintained in the liquid by means of a current of air.

The process therefore by which it is proposed to clarify sewage is, in the first place, to remove the grosser solids, either in a plain sedimentation tank, an Emscher tank, or a Dibdin slate bed, in such a manner, i.e., as shall give rise to the least amount of putrefactive change in the liquid portion of the sewage. The effluent from this preliminary process would be led into a second tank, where it is inoculated with the organism, a small dose of ferric salt is added, and air blown through till clarification sets in. A period of settlement is then allowed for precipitation of the coagulated matter, and eventually the clear liquid is run off, either for rapid final filtration or for direct discharge into the stream. The precise mode of action of the organism is not yet fully worked out, but it seems likely that simultaneous precipitation and solution takes place, some of the organic matter being converted into amido derivatives, and some being coagulated and thrown down with the ferric hydroxide.

The ordinary methods of sewage analysis fail to reveal the change which has really taken place during this process, as they do not differentiate between organic and nitrogenous material in the colloidal and crystalloidal states respectively. It should be pointed out that a fairly strong solution of amido acids, which are the end products of protein degradation, is not necessarily putrefactive, though they require oxygen for their final conversion into nitrate. A recent unpublished research by Mr. R. M. Beesley, a co-worker of the authors, has shown that there is no great difference between the rate of oxidation of substances such as uric acid and glycin, and simpler bodies such as urea. It may be anticipated, therefore, on all grounds, that the clarified liquid resulting from the process as above described can be oxidised at a very rapid rate.

As the conditions during the process are maintained, as far as possible, aerobic throughout, and there is always a certain amount of ferric hydrate present to oxidise offensive sulphur compounds, it is not anticipated that the aeration can give rise to nuisance, and none has been observed in laboratory trials where these conditions have been fulfilled. Experiments in the laboratory with quantities up to four litres have shown that it is possible to clarify a strong faecal emulsion in this way.

A limpid, sparkling and non-putrefactive effluent was obtained from domestic sewage drawn from a sewer near the laboratory. Ordinary tank effluent from the Manchester Corporation sewage works at Davyhulme has been rendered non-putrefactive on incubation. So far only approximate estimates can be given of the amount of iron salt required and the duration of the blowing process. Experiments would indicate that 1 grain of iron-salt per gallon is the maximum need, and that a total of twelve hours' tankage—i,e.. six hours' aeration and six hours' settlement—will be sufficient.

As regards the inoculation of the organism, once the growth has been established in a tank there appears to be no difficulty in maintaining it. The fact that large bodies of water in the old colliery workings at Worsley, near Manchester, are teeming with the organism, is sufficient evidence of its vitality. An experimental plant has been erected at the University of Manchester which will permit of accurate observations of this process to be made, and sufficient data to be collected to serve as a basis for work on the larger scale. It is already evident that the conditioning factor is the cost of an air blast; the pressure of air will, of course, depend simply on the depth of water to be blown through, and a number of engineering conditions will naturally affect this part of the problem.

It is reasonable to suggest that much of the power required could be obtained on the one hand from gas collected from the fermentation of the main bulk of the sewage solids, either in Emscher tanks or by some kindred process, or the fall available from the aerating tank might often admit of the water-head being turned into power. In any event the authors believe that they are justified in bringing the idea forward at this congress in order that it may be discussed from different points of view.

Aeration of Sewage

Experiments on the aeration of sewage in different ways have, of course, been made by different observers. Dr. Dupre and Mr. Dibdin, in Vol. 2 of the Report to the Royal Commisison on Metropolitan Sewage Discharge, in 1884, describe a large number of experiments on the aeration of London sewage. In 1888, Mr. Hartland, in conjunction with Mr. Kaye-Parry, patented an aeration chamber for purification of tank effluent. In 1892, Mr. Sydney R. Lowcock conducted experiments on the aeration of filter-beds by a forced air supply. Dr. Adeney's long series of careful researches have thrown great light on the chemical changes occurring when sewage is completely oxidised by prolonged aeration. In 1897 one of the present authors carried out extensive experiments on the aeration of tank effluent under various conditions, and recently Messrs. Black and Phelps have carried out a number of experiments on the aeration of New York sewage, while the subject is also being studied by the chemists of the Massachusetts State Board of Health.

The advance claimed in the present communication is the use of a specific organism found in Nature, together with iron salts, to effect the clarification of the effluent—that is, the coagulation of the colloidal matter as distinct from the purification of the effluent taken as a whole. To use a simple illustration, the addition of a little rennet does not appreciably alter the composition of milk as a whole, but separates it into a solid and liquid portion. The endeavour of the authors has been to obtain a similar result in the case of a sewage tank effluent; to collect the precipitated colloids, and purify the liquid portions by high speed filters, or it may be in large tanks stocked with suitable aquatic plants.

One of the most remarkable feats in railway construction and railway development ever recorded has been the creation of the Canadian Northern Railway system, says Engineering News. A dozen years ago the Grand Trunk and Canadian Pacific controlled nearly the entire railway system of Canada. There seemed no possibility that a new enterprise could arise to compete with these great and powerful companies. From comparatively small beginnings, however, the Canadian Northern system has grown at such a phenomenal rate that it now has nearly 5,000 miles of railway in operation and 2,500 miles additional under construction. At present, the system comprises two widely separated groups of lines in the eastern and western provinces, but construction is well advanced upon the connecting line which will link these up into one homogeneous system. In view of this development the railway will require extensive terminal facilities at Montreal, and in order to secure a direct and convenient entrance to that city a three-mile tunnel is being driven through Mount Royal, the mountain which dominates Montreal Island and gives its name to the city. This tunnel is of special interest from its section and its length, and especially for the great speed with which it has been driven.

A novel cement for concealing the flaws in wood may be prepared as follows: Put any quantity of fine sawdust of the same wood your work is made with into an earthen pan, and pour boiling water on it; stir it well, and let it remain for a week or ten days, occasionally stirring it. Then boil it for some time, and it will be of the consistency of pulp or paste. Put it into a coarse cloth and squeeze all the moisture from it. Keep for use, and, when wanted, mix a sufficient quantity of thin glue to make a paste; rub it well into the cracks or fill up the holes in your work with it. When quite hard and dry, clean the work off, and, if carefully done, you will scarcely discern the imperfection.

Loans on reinforced concrete structures and the periods granted for their repayment have been investigated by a committee of the Concrete Institute, according to the "Surveyor." It was determined that the government board had not fixed any definite period, but dealt with each case on its merits. However, the following periods are taken as a basis of comparison for the more common types of construction: Bridges with flat superstructure properly protected by a layer of asphalt or other suitable material, reservoirs and tanks containing liquid, 10 years; arched bridges protected from moisture by a layer of asphalt or other suitable material, 15 years.

Many Fine Exhibits Seen at Toronto

Higher Standards Generally in Evidence at the Canadian National Exhibition—Creditable Displays by the Constructional Interests

THE 35th Annual Canadian National Exhibition of 1913 established a general high-water mark. Not only was the attendance greater, as we were reminded constantly by the Exhibition directors—who in their enthusiasm waxed over-strong on this point, perhaps—but also greater care was shown in the manner of exhibiting the various lines of manufacture—at least this applied to those products which entered into the immediate constructional domain and which, after all, formed a fair proportion of the total number and represented a substantial part of the value of the exhibits shown.

We are quite in accord with the Hon. G. E. Foster, who complimented the Directors of the Exhibition on the perennial freshness of the show and paid tribute to the value of the great national event as a medium for bringing people from all parts of the country into close personal contact with each other.

Undoubtedly the Exhibition plays a great part in the development of the country in that it improves trade relations and provides an incentive for higher attainment. Few complaints were heard this year, except perhaps on the score of transportation—and this problem, we suppose, like the poor, we shall always have with us.

Below we give brief mention of a number of the more interesting exhibits identified with the field of this journal. Pressure of space prohibits our devoting more attention to the many interesting lines, but we shall be glad to learn of any notable omissions and to receive supplementary particulars.

Galt Stove and Furnace Company, Limited, Galt, Ont.—Exhibiting a line of their "Majestic" coal chutes. These chutes can be installed in either new or old buildings. The ready operation of the chute under all conditions is a meritorious feature.

Buffalo Pitts Company, Buffalo, N.Y.—This company demonstrated their haulage train on the grounds. This train is used very extensively by municipalities and contractors in Canada and the United States. The train consists of a road locomotive and half a dozen patent reversible type of road cars which can be steered either way by simply throwing a lever.

Tuec Company, Toronto—Demonstrating the Tuec stationary air cleaners which have already been described in detail in this journal and the efficiency of which is too widely recognized to call for comment. Mr. J. J. Martindale, who was in charge of the exhibit, reported excellent business.

The John Deere Plow Company, Toronto.—Exhibiting a number of road plows and also demonstrating the Watson dump wagon.

W. D. Beath & Son, Toronto.—An extensive line of switches and cross tracks, as well as a variety of derricks, both hand power operated.

The Ontario Wind Engine & Pump Company, Limited, Toronto.—Demonstrating the efficiency in the operation of their pumps and other lines. Also showing the Chapman gas engine.

The Geo. B. Meadows Toronto Wire, Iron & Brass Works Company, Limited.—This company were exhibiting a number of samples of their ornamental iron, bronze and brass work and metal lockers. As a new feature they had a sample of their latest line of stairways which was attracting considerable attention.

The Luxfer Prism Company, Limited, Toronto, Ont.—Some very handsome examples of memorial windows were to be found at this company's exhibit. They also had on view a full range of their prism lines.

Abram Cement Tool Company, Windsor, Ont., were exhibiting a full line of the "Abram" wrist motion tools. Mr. Abram doing the demonstrating work in the space occupied by Wettlaufer Bros., Toronto, who are agents for this line.

F. W. Bird & Son, Hamilton, Ont.—This company had some attractive samples of their well-know Neponset wall board, Neponset flooring sound-deadening felt and a full line of their Neponset products.

The Cockburn Lumber & Concrete Company, Dundas, Ont., have recently started the manufacture of a product which is composed of crushed rock and Portland cement. This material, they claim, will greatly improve with age.

Dominion Belting Company, Limited, Hamilton, Ont.—A full line of "Maple Leaf" products was on view in this booth, an attractive display of "Maple Leaf" brand stitched cotton duck belting being shown. The "Crescent" belt fastener was also demonstrated.

The Dennis Wire & Iron Works Limited, London, Ont.—Various types of metal and steel doors and lockers formed the chief items of interest in this exhibit. There were also on view some ornamental designs in lamps and lamp stands.

Black Building Supply Company, Limited, Toronto, Ont.—Some very handsome terra cotta work manufactured by the Northwestern Terra Cotta Company, Chicago, decorated the walls of this exhibit. The company also had a good example of an old-fashioned fireplace, which was equipped with the "Covert Improved" fireplace damper.

William Hamilton Company, Limited, Peterboro, Ont.—This company were making a feature of their centrifugal pumps and an improved Samson water turbine. The pumps have been especially designed for contractors' work. The exhibit was in charge of Mr. R. C. Cameron, sales manager.

The Pedlar People of Oshawa, Ont.—Showing their lines of "Toncan" metal and corrugated pipe. One of their garages was exhibited in use as an office. The portable, galvanized metal structures made in unit sections by this company were of special interest. The metal lath known as "Perfect" came in for considerable attention. Corrugated culverts were a feature of interest.

The Metal Shingle and Siding Company, Ltd., Preston, Ont.—Associated with the A. B. Ormsby Company, Limited, Toronto. Had an interesting exhibit in the shape of a model barn, constructed of steel trusses covered with wood sheeting and having a galvanized roof and sides.

M. Hutchinson, Toronto.—Demonstrating the Hutchinson combination woodworker, a machine which is a labor and money saver for builders, contractors, etc. This machine attracted considerable attention.

R. A. Lister & Company, Limited.—Demonstrating the Lister-Bruston automatic electric generating plant which is especially suitable for small towns, hotels, clubs, churches, etc, requiring no skilled engineer in its operation. This company have lately installed a plant for town lighting for the municipality of Shawville, Que.

The Brantford Roofing Company, Limited, Brantford, Ont.—Occupied a house in the grounds which was covered with their roofing. Their principal exhibits were "Climax" insulating building paper, "Oneida" sheathing paper and their various makes of paint.

Canadian Bitumastic Enamel Company, Toronto.—Showing Bitumastic solution, which is applied in the same manner as paint and is not affected by extreme temperatures. Bitumastic enamel, which is applied on iron, steel and concrete surfaces, hardens immediately after it is applied.

The Bateman-Wilkinson Company, Limited, Toronto.—Among their general line of contractors' supplies were their well-known drag and wheel scrapers, which were especially noteworthy.

General Machinery Company, Limited, Toronto, Ont.—The Luitweiler system of water supply, especially adapted for firms, hotels, municipalities, etc., was one of the chief features of this exhibit. They were also showing the Muncie oil engine, which is run with crude oil.

Wettlaufer Bros., Toronto, Ont.—One of the most comprehensive and interesting exhibits on the grounds. As usual the firm's concrete mixers, which are too well known to the trade to require describing here, were the centre of attraction. A noteworthy feature of the exhibit was a cement brick machine shown for the first time. Other extensive lines, for which the company are agents, were also shown.

London Concrete Machinery Company, London, Ont.—The principal lines shown by this company were brick machinery, wheelbarrows, batch and continuous mixers, tile moulders, sidewalk tools and the "Standard" gas engine. This well known firm manufacture a complete line of contractors' machinery. Their exhibit was one of the most interesting in the line of heavier equipment.

Asbestos Manufacturing Company, Limited, Montreal.—The principal features of this exhibit were Asbesto-cement, Asbesto-slate and asbestos shingles, together with their other well-known lines.

Batts Limited, Toronto.—Exhibiting an extensive line of doors and columns in the Process Building. Also had an outside exhibit in the form of a pergola which was perhaps the most attractive of its kind in the grounds.

Alabastine Hard Mortar, Limited, Toronto.—The well-known Anchor Brand products were made a special feature by this company and the literature displayed described very fully many advantages of their products.

Alabastine Company, Limited, Paris, Ont.—The Paristone wall plaster, Pulpstone and special exterior plaster were the chief specialties shown by this company at their very attractive display. Special mention may be made of the new popular marble white plaster of paris.

Waterous Engine Works Company, Limited, Brantford, Ont.—Making a special feature of steam rollers at their exhibit. Also demonstrating a line of their trouble-proof pumps.

Goodyear Tire & Rubber Company of Canada, Limited, Toronto.—A very pleasing exhibit of their automobile tires in the Transportation Building. The firm have recently received an order for their special belting from the Saskatchewan Government.

W. A. Martin & Company, who have recently moved into new premises at 70 Lombard Street, Toronto, had a very extensive exhibit. They were showing the full line of the Graton & Knight Mfg. Company's belting, specializing particularly on waterproof leather belting. They also showed A. B. C. foolproof steel, manufactured by Messrs. Darwin & Milner, of Sheffield, England; Gripoly belting; Callender's alloys, babbits and bronzes, and the Crescent belt fastener. They are agents for, and were demonstrating, the E. C. C. motors made at Wolverhampton, England, by the Electrical Construction Company. Mr. R. Green, who was in charge of the exhibit, is sales manager for W. A. Martin & Company.

Linde Canadian Refrigeration Company, Limited, Montreal.—Besides the interesting exhibit which was to be found at their own booth, this company called attention to the fact that they had supplied the refrigerating plants both in the dairy and horticultural buildings. These exhibits attracted considerable attention.

Dominion Sewer Pipe Company, Limited, Swansea, Ont.—A well arranged display of sewer pipes was shown by this company. They were also exhibiting their other well-known lines of chimney tops, wall coping, culverts and inverts.

Canadian Fairbanks-Morse Company, Limited, Toronto, Ont.—Two or three specialties exhibited by this company were cradle dump cars and a full line of their oil engines, a number of which they were showing in running order.

Consumers Gas Company, Toronto.—A very handsome line of lighting fixtures was exhibited by this company. The large variety shown attracted a great deal of interest.

Report on Shoal Lake Water System for City of Winnipeg

THE report of the consulting experts on the greater Winnipeg water district scheme to bring water from Shoal Lake was submitted to the city last week. The whole report was read by Mayor Deacon. The formal adoption of the report was deferred for a week to enable the members of the board to become familiar with the details, which are, briefly, as follows:

Estimated cost, $13,045,000.

Total length of aqueduct, 95.35 miles.

Gravity system will bring water through a concrete aqueduct 84.75 miles to a point about one mile east of Transcona.

Shoal Lake water of excellent quality for domestic and manufacturing purposes.

Water is soft, practically free from contamination, without noticeable color, free from odors and of agreeable taste.

Shoal Lake will give ample supply until population reaches 850,000.

Intake to be at head of Indian bay, and Falcon river to be diverted into Snowshoe bay to cut off drainage of muskeg waters.

From Transcona into Winnipeg, 5-foot steel is recommended with crossing into city at Victoria Park under river in 5-foot cast iron pipe.

Four-foot cast iron pipe in tunnel to convey water through city to McPhillips street reservoirs.

Concrete aqueduct to have capacity of 85,000,000 gallons per day.

Storage reservoir at Transcona with capacity of 250,000,000 gallons is recommended when required, but need not be constructed immediately. Estimated cost of reservoir from $300,000 to $400,000.

Main pumping station at Transcona to force water through 5-foot steel pipe into city and districts requiring water.

Annual cost of maintenance and operation estimated at $40,000.

Five years set as time for completion of work.

Experts strongly recommend liberal extensions of present well system as far north as possible to care for needs of city until Shoal Lake scheme is completed.

Forthcoming Road Congress at Detroit

Arrangements Completed for Event of Outstanding Interest to all Identified with Road Improvement—An Attractive Programme

THE third American Road Congress will convene at Detroit, Mich., September 20 to October 4. The regular day sessions will be held at the Wayne Gardens, while the evening and special sessions will meet at the Hotel Pontchartrain.

On September 29 there will be addresses by Federal, state and municipal officials and others, a garden party and a series of banquets at several of the local clubs.

Tuesday, September 30, will be devoted to discussions of legislative matters under the leadership of the American Bar Association.

On Wednesday, October 1, the construction and maintenance session will convene under the auspices of the American Highway Association. Papers will be read by title only and will be followed by discussion. In the evening a boat ride is scheduled.

The American Automobile Association will direct the road users' session on the morning of Thursday, October 2. In the afternoon the American Bankers' Association will preside over the finance session.

Friday, October 3, is to be "Michigan Day," and the proceedings will be directed by the Michigan State Good Roads Association. In the evening there will be the annual meeting and election of officers of the American Highway Association.

The last day of the convention, Saturday, October 4, will be devoted to the report by the committee on resolutions.

There will be an exposition of road materials and machinery.

A partial list of the papers to be presented at the Congress follows:

"The Labor Problem in Road Construction," by Captain P. St. J. Wilson, state highway commissioner of Virginia; discussion to be opened by Mr. W. E. Atkinson, state highway engineer of Louisiana.

"Systematizing the Purchase of Road Materials and Equipment," by Henry G. Shirley, chief engineer, State Roads Commission of Maryland.

"Unsurfaced Roads," by Mr. W. S. Keller, state highway engineer of Alabama; discussion to be opened by Mr. George W. Cooley, state highway engineer of Minnesota.

"Gravel Roads—Their Construction, Maintenance, Cost and Special Treatment," by Hon. S. Percy Hooker, state superintendent of highways of New Hampshire; discussion to be opened by Mr. H. L. Bowlby, state highway engineer of Oregon.

"Treatment of Wornout and Ravelled Macadam Surfaces,' by Colonel E. A. Stevens, state highway commissioner of New Jersey; discussion to be opened by Hon. Robert C. Terrell, state commissioner of public roads of Kentucky.

"Bituminous Macadam Construction and Maintenance," by Mr. S. D. Foster, chief engineer, State Highway Department of Pennsylvania; discussion to be opened by Mr. W. A. McLean, Provincial Engineer of Ontario, Canada.

"Brick Roads," by Mr. James M. McCleary, county engineer of Cuyahoga County, Cleveland, Ohio; discussion to be opened by Mr. R. Keith Compton, chairman, Paving Commission, Baltimore, Md.

"Concrete Roads," by Hon. Frank F. Rogers, State Highway Commissioner of Michigan; discussion to be opened by Mr. Paul D. Sargent, state highway engineer of Maine.

"Selection of Road Materials," by Hon. Logan Waller Page, director U. S. Office of Public Roads.

"Dust Prevention."

"Drainage Structures," by Mr. A. R. Hirst, state highway engineer of Wisconsin; discussion to be opened by Prof. T. H. MacDonald, state highway engineer of Iowa.

"California's $18,000,000 State Highway System," by Mr. A. B. Fletcher, state highway engineer of California.

"Highway Accounting, with Special Reference to Maintenance," by Mr. Halbert P. Gillette, editor-in-chief, "Engineering and Contracting."

"The Organization and Management of Working Forces," by Mr. A. N. Johnson, state highway engineer of Illinois.

"Contract Law," by William Bowman, of New York.

"The Protection and Upkeep of Road Equipment," by Mr. Daniel J. Hauer, of New York.

"The Merit System in Road Management, by Hon. J. A. McIlhenny, president U. S. Civil Service Commission.

"Financing Road Improvement," by Mr. Wm. G. Edens, president, Illinois Highway Improvement Association.

"Bond Issues for Road Improvement," by Mr. S. E. Bradt, vice-president, First National Bank, DeKalb, Ill.

"The International Congress and the Roads of England, France and Germany," by Col. Wm. D. Sohier, chairman, Massachusetts State Highway Commission.

"Economics of Road Improvement," by J. E. Pennypacker, secretary, American Highway Association.

"Dirt Roads and Politics," by Charles P. Light, former state highway commissioner of West Virginia.

Addresses by Hon. James H. MacDonald, Dr. Jos. Hyde Pratt, Mr. Clarence A. Kenyon, and others.

With the completion of the great dam which the Vancouver Island Power Company has been constructing for the past year at its Jordan River power plant, one of the largest works of its kind in Canada is now ready to fill its part in the development of power for the operation of commercial enterprises in the southern end of Vancouver Island. The dam, which is the highest in Canada and has cost nearly three-quarters of a million, will provide storage capacity sufficient to assure an ample supply of water for the operation of the turbines. The necessity of additional storage capacity became imperative when the company undertook to raise the capacity of the power plant from 12,000 to 32,000 horse power. The work of installing the additional units in the power house has been under way for some months. With this increase in power and the Brentwood Bay steam auxiliary plant of 6,000 horse power in reserve, the company will have ample power to operate the lines of the B. C. Electric Company, and meet the remarkable increase in the demand for power for industrial and commercial purposes.

A contract has been awarded to Mr. E. G. M. Cape, Montreal, for the construction of a new factory and offices for the Imperial Wire and Cable Company, Montreal. The building has been commenced on the site at St. Patrick street. The factory and offices will comprise several structures, the principal being one of eight storeys. When completed, the factory will be one of the largest and best equipped in Canada. The machinery will all be run by electric power.

Paving Brick Manufacturers to Convene at Cleveland

The National Paving Brick Manufacturers' Association's tenth annual meeting, September 17 and 18, will be marked by a paving conference which will attract city engineers and other officials and paving contractors from all parts of the country.

At recent meetings of the brick committees of the American Society of Municipal Improvements and the American Society for Standardizing Paving Specifications, incidental to the discussion of matters which came before that committee, it was suggested that if at some time prior to the annual meeting at Wilmington, Deleware, an itinerary of study and investigation at the paving brick plants could be arranged for by the National Paving Brick Manufacturers' Association it would be both acceptable and desirable.

Committees from these societies will therefore meet at the Statler Hotel, Cleveland, at 8.00 a.m., Monday, September 15, to spend that day and the Tuesday following visiting brick plants and to remain in the city as guests of the National Paving Brick Manufacturers' Association during the 17th and 18th, the days of the annual meeting.

Judging from the acceptances which have come from engineers and other city officials at least 150 officials, together with 75 paving contractors, will be present, while representatives of the various engineering, trade, automobile and civic publications, together with the paving brick men themselves, will swell the total attendance to nearly 300.

The meeting will be exceedingly important in that it will bring together, for the first time, engineers from the leading cities of the country and almost the entire body of paving brick manufacturers. It will afford engineers and paving brick manufacturers an excellent opportunity to discuss their problems on common ground.

The mornings of the 17th and 18th will be devoted to the business sessions of the Association. The reports which will be read by President Chas. J. Deckman, Secretary Will P. Blair, Treasurer C. C. Barr and Assistant Secretary H. H. Macdonald, will show that the Association has had the most successful year in its history.

Both Cleveland and Cuyahoga County are adding largely to their mileage of brick pavements this year and opportunity will be accorded to witness brick pavement construction in every detail from grading to grouting.

It was at the last annual meeting that the decision was reached to hold future conventions of the association during a season of the year when brick road construction methods could be viewed in actual progress. Many engineers and contractors have written the association that they are looking forward with much interest and pleasure to a personal inspection, for the first time, of the thousand miles of city streets and country roads of Cleveland and Cuyahoga County of which they have read and heard.

About eighty motor cars will be required for the trip over the streets and roads. Every paving brick manufacturer who is the fortunate possessor of an automobile or a stable of automobiles has promised to drive his car to Cleveland for the big event. The itinerary for the inspection of Cleveland's city streets will include visits to brick pavements laid as long as nineteen years ago.

Mr. Chas. J. Deckman, President. Mr. W. P. Blair, Secretary

Officers of the National Paving Brick Manufacturers' Asssociation.

The inquiry into the design and suitability of the Montreal filtration plant will cost the city $7,500, which includes fees of $100 per day for each of the three engineers appointed.

For August the Montreal building permits totalled $2,318,672, as compared with $1,364,830 in the corresponding month last year. The total for the year is $13,816,622, against $11,179,376 in 1912.

With a view to remedying the dust nuisance caused by motor cars, the Town Council of Outremont, P.Q., have decided to put a new topping of granite screenings on St. Catherine Road and treat it with tarvia.

Messrs. O'Brien & Doheny, contractors, have commenced an action against the Quebec and Saguenay Railway Company for $839,511, balance of money due under contract and for damages for its breach. Another action for $300,006 is still pending.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Waterworks, Sewerage and Roadways

Brampton, Ont.

Storm sewers for Town Council. Clerk, W H. McFadden. Matter has been passed by Sewers Committee for storm sewers on Queen St., Hosie Lane, Isabella and Railroad streets, and Helstone Ave.

Montreal, Que.

Sewage disposal for Montreal City. Sec.-Treas., L. N. Senecal. R. S. Lea, consulting engineer, New Birks Bldg., Montreal, preparing report for City of Montreal for disposal of sewage in N. D. G. Ward.

Drains and water pipes, cost $8,500, McGregor street, contemplated. Sec.-Treas., L. N. Senecal. Board of Control passed the report.

Sewer, Queen Mary's Park, for City Realty Investing Co., Ltd., 41 Mayor St. Tenders close with owners Sept. 15 for laying 12-in. sewer pipe in this subdivision. Engineer, Thos. Iverson, 10 Cathcart street.

Ottawa, Ont.

Pavements, cost $50,000, for City of Ottawa. Mayor, J. A. Ellis. Controller, Mr. Nelson. Engineer, Archibald Currie, City Hall. Asphalt pavements on O'Conner, Queen to Laurier, James St., Elgin to Bronson, McLaren St., Elgin to Bank St.

City Council contemplate purchasing road roller with scarifier, sprinklers and other road machinery and equipment, estimated cost $25,000. City engineer, Archibald Currie.

Chlorinating buildings, cost $7,000, planned by City Council. Mayor, J. A. Ellis. City engineer, Archibald Currie. Asst. waterworks engineer, A. N. Beer. Solid brick construction, concrete foundation, felt and gravel roofing. To be erected on Lemieux Island in connection with new sedimentation basin. Tenders will be called shortly.

Regina, Sask.

Pavement on Broad St. Subway, planned by City Council. Engineer, F. McArthur. City Commissioner, L. A. Thornton.

City Council plan the construction of approximately 12 miles of plank sidewalk throughout Annexes of City of Regina.

Toronto, Ont.

Street extension, cost $16,000, planned by Board of Control. City Clerk, W. A. Littlejohn. Florence street, westerly to Coxwell; Cairns street, westerly to Coxwell; Orchard Park, northerly to Maughan Road.

Twp. of Brantford, Ont.

Cement sidewalks. Twp. Engineer, A. M. Jackson, Brantford. Plans and specifications at office of engineer. Tenders received by engineer until Sept. 13th, for the construction of 4063 ft. of 4 ft. cement sidewalks. Tenderers are expected to look over site of the work before submitting bids.

Winnipeg, Man.

150 6-in. hydrants recommended by the Board of Control. Sec., M. Peterson. Engineer, H. N. Ruttan, 223 James Ave. Tenders received by Board of Control till Sept. 19th. Plans, etc., at Engineer's office.

Cast iron pipe required by Board of Control. Sec., M. Peterson. Engineer, H. N. Rutton, 223 James Ave. 3,000 lin. ft. cast iron water pipe 4 in.; 24,000 lin. ft. cast iron water pipe 6 in.; 12,000 lin. ft. cast iron water pipe 8 in.; 8,000 lin. ft. cast iron water pipe 10 in.; 1,500 lin. ft. cast iron water pipe 12 in. Plans and specifications at office of Engineer. Tenders received by Board till Sept. 19th.

Water system, cost $13,000,000, plans approved by City Council. Engineer, H. N. Ruttan, 223 James Ave. Concrete aqueduct 85 miles, steel pipe 10 miles from Shoal Lake. Concrete reservoir at Transcona to have a capacity of 250,000,000 gals. Report furnished by experts has been adopted.

Sewers and granolithic walks planned. Engineer, H. N. Ruttan, 223 James ave. Granolithic walks: S. side MacDonald ave., from Maple street to 350 ft. east. S. side Wardlaw ave. from John street to Wellington cres. Sewers: Dorchester ave. from Lot 16, B1.96 to Rockwood St. Eaton street from Herbert to Talbot ave. Specifications at engineer's office.

CONTRACTS AWARDED

Sudbury, Ont.

Storm sewers, cost $9,944.60, planned by Town Council. Clerk, George Elliott. Engineer-in-charge, A. Tessier. General contractors, Blanchard & Shanahan.

Toronto, Ont.

Sewer, cost $356,000, planned by Board of Control. Commissioner of Works, R. C. Harris. General contractors, Donnelly & Graham, Shaw and Arthur. West Toronto Div. No. 2 Woodville Ave, 63c. per lineal ft. for brick, 62.23c. per lineal ft. for concrete.

Sewer, planned by Board of Control. Mayor, H. C. Hocken. Commissioner of Works, R. C. Harris. General contractors, Moran Construction Co., Ottawa, Ont. Midway sewer system outlet, $89,416. General contractor, Joseph O. Jerow, 90 Curzon St., Earlscourt drainage system, $45,834.

Railroads, Bridges and Wharves

Annapolis Royal, N.S.

Dom. Atlantic Rly. approved plans of company's station to be erected at Annapolis Royal.

Arundel, Que.

C. N. O. Rly. have authorized company to construct a suitable station at Arundel, Que.

Bethany Junction, Ont.

C. P. Rly. have been authorized to construct bridge No. 37.9 Toronto Subdivision, near Bethany Jct.

Blenheim Twp., Ont.

Miller drain planned. Tenders received by Hugh Allan, Drumbo, until Sept. 13th. Specifications at his office.

British Columbia

Esquimalt & Nanaimo Rly. have approved locations of stations to be erected at Union Bay and Courtenay.

Cariboo District, B.C.

G. T. P. Rly. Co. authorized to construct bridge across Dome Creek.

Fort George, B.C.

G. T. P. Rly. have authorized company to construct bridge across Cottonwood Creek District of Fort George.

Frater, Ont.

Algoma Central & Hudson Bay Rly. have approved location and details of station proposed to be erected at Frater District of Algoma.

Guelph, Ont.

Council will shortly vote on by-law to provide for extension of tracks and switching facilities for Robert Stewart & Co., Ltd. City engineer, M. Ferguson.

Bridge and retaining wall, Neeve St., planned by City Council. Clerk, T. J. Moore. Engineer-in-charge, M. Ferguson. Plans have been approved and work will commence as soon as possible.

Limerick, Sask.

C. P. Ry. have approved company's location of proposed station on the Weyburn Westerly Branch.

Moncton, N.B.

Tenders received by Sec., L. K. Jones, Ottawa, Dom. Govt., Dept. of Railways and Canals, till Sept. 19th. Plans and specifications at offices of Sec., Station Master, Derby Junction, N.B., Chief Engineer, Moncton, N.B., for Diversion of Line—Nelson to Derby Junction, N.B., for construction of line of railway.

Mulvihill, Man.

C. N. R. have been authorized to construct a standard portable passenger and freight shelter and a 2-car cattle pen.

Prov. of Ontario

C. P. Rly has been authorized to construct bridge No. 88.6.

Osgoode Township, Ont.

Concrete bridges for Township Council. Clerk, Chas. MacNab. Concrete bridge opposite Lot 22, Con. 7. Plans and specifications at office of Engineer, R. W. Farley, Hope Bldg., Ottawa.

Oshawa, Ont.

Dredging for Dom Govt., Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Tenders to be called shortly.

Port Burwell, Ont.
C. P. Rly have approved location of station between Wellington and Robinson sts., Port Burwell, Twp. Bayham, Co. Elgin.

Rochester Twp., Ont.
Eight bridges, cost $10,000, planned. Clerk, M. N. Mousseau, South Woodslee, Ont. Engineer, James Laird, Essex. By-law passed.

St. Catharines, Ont.
Welland canal, section No. 2, planned by Dom. Govt., Dept. of Railways and Canals. Secretary, L. K. Joies, Ottawa. Chief engineer, J. L. Weller. Tenders will be called in about a week.

Welland canal, section No. 4, planned by Dom. Govt., Dept. of Railways and Canals. Secretary, L. K. Jones, Ottawa. Chief engineer, J. L.Weller. Tenders will be called in about four weeks.

St. John, N.B.
City Council are authorized to construct bridge over C. P. R. at Alexandra St. extension.

Twp. of Tilbury North, Ont.
Four bridges planned. Clerk, J. A Tremblay, Tilbury, Ont. By-laws passed by Council, 2 bridges over North Town Line Road and 2 over Chauvin Drain. Concrete and steel construction.

Victoria, B.C.
Bridge for C. N. P. Rly. Trestle bridge and embankment across Selkirk River . Plans prepared.

CONTRACTS AWARDED

Sault Ste. Marie, Ont.
Dock, cost $50,000, planned for Standard Oil Co. General contractor, Jno. Boyd, Sault Ste. Marie.

St. Catharines, Ont.
Welland canal, cost $10,000,000, Sec. No. 3. Dom. Govt., Dept. of Railways and Canals. Secretary, L. K. Jones, Ottawa. General contractor, M. J. O'Brien and Hugh Doughney, Thorold.

Welland Co., Ont.
Bridge, cost $1,500, Lyons Creek, for County Council. General contractor, A. Goebel, Port Colborne.

Public Buildings, Churches, Schools, etc.

Brantford, Ont.
Sunday school and lecture room, cost $7,000, St. Paul Ave., for Baptist Church. Pastor, Rev. Thos. E. Richards, 110 Chestnut Ave. Architect, Lloyd D. Barber. Two storeys, 50 x 47, concrete foundation, pressed brick construction. Plans in progress.

Calgary, Alta.
Parks planned by City Council. Clerk, J. M. Miller. By-law to be voted on Sept. 28 for improvement and equipment for parks, cemeteries, etc.

Coquitlam, B.C.
School, cost $12,000, James Park, contemplated by the Board. Architect, J. Z. Long. Tenders will be called for in a week.

Duck Lake, Sask.
Town hall, cost $11,000, contemplated by Town Council. Mayor, Paul Ashby. Sec.-Treas., J. A. Perret. By-law to be submitted to the ratepayers on Sept. 12th for a town hall which will include a permanent place for the fire apparatus of the town.

Kingston, Ont.
Sunday School Hall planned for St. James Anglican Church congregation, Union street. Rector, Rev. T. W. Savary, 152 Barrie street. Tenders will not be called until next spring.

Macleod, Alta.
School, cost $13,500, for MacLeod Public School Dist. No. 47. Treas., E. Forster Brown. Plans being prepared.

Melville, Sask.
Convent, cost $15,000, contemplated for the Order of Black Veiled Nuns. Plans will be prepared.

Palmerston, Ont.
Barracks, cost $10,000, for Salvation Army. Major, F. Morris, Clarence St., London. Architect, Major Miller, Toronto. Two storeys, white brick construction, stone and concrete foundation. Plans in progress.

Port Alberni, B.C.
School for The Alberni Land Co. A site has been secured and a new High School is contemplated.

Port Arthur, Ont.
Interior fittings, post office. Tenders received by Sec., R. C. Desrochers, Ottawa, Dom. Govt., Dept. of Public Works, until Sept. 18th. Plans, etc., at offices of Mr. D. McKenzie, caretaker, Port Arthur; T. A. Hastings, clerk of works. Postal Station "F," Yonge St., Toronto, and Dept., Ottawa.

Prince Rupert, B.C.
Drill hall planned by Dom. Govt., Dept. of Militia and Defence. Sec., E. F. Jarvis, Ottawa. Deputy Minister, Eugene Fiset. Specifications, etc., at offices of District Officer Commanding Military District No. 11 Victoria, City Clerk, Prince Rupert, and Director-General of Engineer Services, Ottawa. Tenders received by Minister till noon Sept. 23rd.

Quebec, Que.
Mausoleum contemplated by The Quebec Mausoleum Co., Ltd., 136 St. James street, Montreal. Three storeys, 50 x 50, concrete construction throughout. Plans in progress, to be erected here and at Sherbrooke.

Regina, Sask.
School contemplated by Royal North West Mounted Police. Commissioner, Mr. Perry, R. N. W. M. P. Barracks. Plans will be prepared.

Swift Current, Sask.
School contemplated for School District No. 1667. Secretary-treas., J. T. Dodds. Competitive plans called. Information from sec.-treas. Competition closes Sept. 30. 16 rooms.

Tilbury, Ont.
Public library contemplated by the Town Council. Clerk, W. A. Hutton. Matter will be considered shortly.

Toronto, Ont.
Board of Control will build new fruit market. Site not selected. Mayor, H. C. Hocken.

Enlargement of Shirley street School, planned by Board of Education. Tenders received by Sec.-Treas., W. C. Wilkinson, until Sept. 12th. Specifications, etc., at office of Supt. of Buildings, City Hall.

Addition to School, Parkdale, planned by Board of Education. Tenders received by Sec.-Treas., W. C. Wilkinson, until Sept. 12th. Specifications, etc., at office of Supt. of Buildings, City Hall.

Vancouver, B.C.
Theatre planned. Architect, C. J. Donnelin, 319 Pender St. W., will receive tenders in a few days, 75 x 120, steel, brick, terra cotta and fireproof construction, heating and ventilating systems.

Drill hall, cost $200,000, Grandview, planned by Dom. Govt., Dept. of Militia and Defence. Sec., E. F. Jarvis, Ottawa. Deputy Minister, Eugene Fiset. Architects, Perry & Fowler, Pacific Bldg., have been commissioned to prepare plans. Fireproof construction.

Immigration building, cost $300,000, foot of Victoria Drive, planned by Dom. Govt., Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Four storeys, 212 x 64, reinforced steel beam construction, laundry.

Victoria, B.C.
Armory, cost $250,000, McBride and Bay Sts., planned by Dom. Govt., Dept. of Militia and Defence. Deputy Minister, Eugene Fiset, Ottawa. Architect, W. Ridgeway Wilson, 323 Pemberton Block. Two storeys and basement, 100 x 120. Tenders are to be called soon.

Watt Twp., Ont.
School contemplated for School Sec. No. 5. Twp. Clerk, Edward Hamilton, Raymond, Ont. Plans will be prepared.

CONTRACTS AWARDED

Cobalt, Ont.
Town Hall, cost $37,000. Clerk, R. L. O'Gorgan. Architects, Angus & Angus, North Bay. General contractors, Hill, Clark & Francis, New Liskeard. Heating, plumbing and electrical, F. R. Gibson, Haileybury.

School, cost $10,000, planned by Town Council. Builder, H. McDowell. Heating, F. R. Gibson, Haileybury. 2 stys.

Hamilton, Ont.
Church, cost $17,500, Grosvenor Ave., for Kensington Methodist. Architect, F. W. Warren, Federal Life Bldg. General contractor, Jno. Bryers, 11 Clinton St. Roofing V. Drew, Cannon St. E. Electric, R. E. Allison & Co., King St. W. Painting, A. E. Williams, Emerald St. N. Plumbing, J. Saynor, John St. S. Carpenter, H. Thombs, Whitfield Ave.

Lloydminster, Sask.
Interior fittings for post office for Dom. Govt., Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractors, J. T. Schell Co., Kenyon, Alexandria, Ont.

Montreal, Que.
Post Office "L," cost $70,000, Westmount (Greene ave.) planned by Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractor, brick and masonry, John

Quinlan & Co., 4412 St. Catherine W., will receive tenders as work advances. Two storeys and basement, 102 x 85. Excavating done.

Boiler house planned by Board of Commissioners, Point St. Charles, Sec., L. N. Senecal. General contractor, J. L. Simmons, 528a Lasalle Road, $6,225.

Ottawa, Ont.

Home, cost $27,000, Turner St., for Friendless Women. Sec., Mrs. Geo. Greene, 320 Waverly St. Architect, C. J. Burritt, 193 Sparks St. General contractors, Taylor & Lackey, 21 1st Ave.

Regina, Sask.

Isolation hospital, cost $77,600. City Council Hospital Board. Clerk, A. W. Pool. Architect, N. R. Darrach, Western Trust Bldg. General contractors, Minkley & Traub. Two storeys, 130 x 40, brick construction, concrete and stone foundation.

Selkirk, Man.

Addition to hospital, cost $65,000, planned by Prov. Govt., Dept. of Public Works. Acting Minister, Hon. G. R. Coldwell, Winnipeg. Prov. Architect, V. W. Horwood, 261 Fort St., Winnipeg. General contractors, Carter-Halls-Aldinger Co., Union Bank Bldg., Winnipeg. Foundations in.

Ste. Croix, Que.

Completing interior of Church, cost $35,000, for R. C. Church congregation. Architects, Talbot & Dionne, 14 St. Joseph street, Quebec. General contractors, Messrs. Paquet & Godbout, St. Hyacinthe, Que. Interior finish in white and gold and pews painted and varnished. 170 x 59.

St. Johns, N.B.

Club house for Elks Club, c/o H. J. Fleming, 130 Pond street. Architect, F. Neil Brodie, 42 Princess street. General contractors, A. R. C. Clark & Son, 51 Water street.

Toronto, Ont.

School, Deer Park. Elec. wiring, Hall & Dollery Elec. Co., 848½ College. Heating and plumbing, F. Armstrong Co., 227 Queen W. Sec.-treas., W. C. Wilkinson, Board of Education.

Wadena, Sask.

School, cost $26,700. Architects, Reilly, Dawson, Hancock & Reilly, 512 Westman Chambers, Regina. General contractors, Collun Bros., Humboldt. Six rooms, brick construction and foundation.

Winnipeg, Man.

Club and stores, Smith street, for Knights of Columbus, Birks Bldg. Architects, J. I. Atcheson & Co., Trust & Loan Bldg. General contractors, Frid Lewis & Co., Somerset Bldg.

Business Buildings and Industial Plants

Dunnville, Ont.

Addition to factory for Canadian Engines, Ltd. Architects, Owners. 40 x 100, artificial stone construction, concrete foundation. Plans ready.

Guelph, Ont.

Factory, cost $7,000, Duke St. Architects and owners, Guelph Lumber Co. Two storeys, concrete foundation, brick construction. Plans in progress.

Medicine Hat, Alta.

Confectionery factory contemplated for Tabor Candy Co., Ltd. Managing director, J. H. Tabor, Lethbridge. President, Ald. W. H. Doty. Factory to be erected as soon as possible. By-law passed.

Montreal, Que.

Livery stable, cost $5,000, planned for Michael Stafford, 409 Aqueduct. Architects, Saxe & Archibald, 59 Beaver Hall Hill. One storey, concrete foundation, brick construction, felt and gravel roofing.

Paint factory, cost $90,000, planned for Martin-Senour Co., 655 Dralet. Architect, W. B. McLean, 204 St. James St. Messrs. Reid, McGregor & Reid were lowest tenderer. Building not likely to be built until spring.

Store and ice cream parlor addition, cost $15,000, 322 St. Catherine W., for Geo. Nicholas & Co., 322 St. Catherine W. Tenders will be received by Architect, D. J. Crighton, Jacobs Bldg., for two weeks for all trades. Three storeys, steel and brick construction.

Manufacturing building, Maisonneuve, for American Can. Co., Ontario St., Maisonneuve. Architects and builders, Owner. New factory to be erected next year. Special machinery required.

Office and warehouse repairs, cost $10,000, 18 St. Helen, for H. Joseph & Co., 16 St. Sacrament St. Architects, Phoenix Assurance Co., Ltd., 100 St. Francois Xavier, are looking after the work.

Ottawa, Ont.

Mill, Bridge St., owned by J. R. Booth, Chaudiere, destroyed by fire. Will rebuild at once, concrete and fireproof construction. Conveying machinery required.

Shop and residence, cost $4,000, for Mrs. R. Moore, Osgoode St. Architect, W. J. Montgomery, 444 Lewis. Two storeys, solid brick construction, stone foundation. Plans drawn.

Petrolia, Ont.

Bakery and store, cost $10,000, for Messrs. Bruce & Hartley, Main and Bedford Sts. Architect to be selected. Two storeys, white brick construction.

Regina, Sask.

Warehouse, cost $20,000, contemplated by Gutta Percha Co., 47 Yonge St., Toronto. Hove been offered lots by City Council.

Sarnia, Ont.

Addition to jam factory, for Sarnia Jam Factory. Architect to be selected.

Toronto, Ont.

Alterations to building, 54 Adelaide E., planned for Smith, McKenzie & Hall, 24 Toronto St., to be occupied by owners. Plans in progress.

Office and warehouse, 216-18 King St. W., contemplated by Can. General Electric Co., King and Simcoe Sts. Sketch plans drawn.

Addition to foundry, cost $9,000, for W. & J. G. Greey, 6 Church St. Tenders received by Architects, G. M. Miller & Co., 93 Yonge St. Two storeys, brick and steel construction, concrete foundation, felt and gravel roofing.

Bank building contemplated for Bank of British North America, Yonge and Wellington streets. Site purchased N.E. cor. Queen and Beech, 40 x 60 ft. Plans will be prepared.

Hotel, King and Simcoe, contemplated by A. L. Solman, 180 King W. Ten storeys, 46 x 90, terra cotta and steel construction. Plans will be prepared.

Bank building plonned by Home Bank of Canada, head office 10 King west. Site purchased 1218-1220 Yonge street. 52 x 100 feet.

CONTRACTS AWARDED

Hamilton, Ont.

Addition to plant, cost $12,000, Depew street, for Dominion Steel Castings Co. General contractors, H. G. Christman & Co., Chancery Chambers. Steel and concrete construction. Permit issued.

Montreal, Que.

One store and flat, cost $5,000, Maisonneuve, for Madam Ester Rousselle, 1313 Franchere, Montreal. Builder, A. Desjardin, 1313 Franchere. 25 ft., 22½ x 50, cement and stone foundation, frame and brick construction.

Stable, cost $6,900, for The Adair Coal Co., 146 Notre Dame W. Architects, Viau & Venne, 76 St. Gabriel. General contractors and masons, Marcello Construction Co., New York. Two storeys, 32 x75, concrete foundation, brick construction.

Addition to factory, cost $30,000, Parthenais, for Dom. Oilcloth Co., 1192 St. Catherine E. Architects, Hutchison, Wood & Miller, 50 Royal Ins. Bldg. General contractors, Church, Ross & Co., 40 Hospital St. Roofing, D. M. Long, rear 36 Windsor. Heating and plumbing, Jno. A. Gordon, 301 St. Antoine.

Store and garage, cost $3,000, Maisonneuve (1st ave. Viauville) for Ferd. Corriveau, cor. 1st ave. and Notre Dame. Builder, H. Papineau, 575 Papineau. 13 ft., 27½ x 25, concrete and stone foundation, frame and brick construction. Foundations in.

Office and warehouse, cost $2,000, 98 King street, for S. H. Ewing & Sons, 98 King street, Montreal. General contractors, Geo. Roberts, 79 Lagauchetiere W. Damage to interior plaster, painting and woodwork to be repaired at once.

Mt. Hamilton, Ont.

Stores, etc., for A. A. Lees, 47½ Main street east, Hamilton. Architect, E. B. Patterson, 167½ Main street east, Hamilton. General contractor, S. Burkholder, Mt. Hamilton. Three storeys, 60 x 122, reinforced concrete construction, concrete foundation, tar roofing. Excavating started.

Ottawa, Ont.

Addition to stores, cost $10,000, Lewis, for Matthew-Lang Co. Architect, W. E. Noffke, Central Chambers. Carpenters, Smith Bros., 448 McLeod. Excavating started.

Quebec, Que.

Confectionery store, cost $5,000, Joseph street, for W. McWilliams, John St. General contractor and carpentry, C. A. Vezina, 61 Desprairies. Two storeys, 40 x 62, steel beams, felt and gravel roofing. Excavation started.

Regina, Sask.

Warehouse, cost $45,850, for W. G. Downing Shoe Co. Architects, Storey & Van Egmond, Credit Foncier Bldg. General contractors, Frid Lewis Co., 901 Somerset Bldg., Winnipeg. Six storeys,

Rosemere, Que.

Stable, cost $3,000, for Otto Donner, Rosemere, Que. Architect, Wilford Gagnon, 1002 New Birks Bldg. General contractor, Jacob K. Hanson, 3055a St. Dominique. Concrete foundation, balloon frame construction, felt and gravel roofing. Excavating done.

Sault Ste. Marie, Ont.

Warehouse, cost $75,000, for Standard Oil Company. General contractor, Jno. Boyd, Soo.

St. John, N.B.

Bank building, cost $20,000, Main St., for Royal Bank of Canada. Manager, T. B. Blair, King street. Architect, K. G. Rea, Beaver Hall Hill, Montreal. General contractor, Jno. Flood, 123 Duke street. Excavating done.

Bank, cost $50,000, for Bank of British North America. Architect, G. E. Fairweather, 84 Germain street. General contractors, B. Mooney & Sons, 112 Queen street. Erecting all concrete forms for first storey of reinforced concrete. Foundations in.

Toronto, Ont.

One pair stores and residences, cost $6,000, Danforth Ave. Owner and general contractor, Harry Lucas, 72 Fulton Ave. Three storeys, 40 x 50, brick foundation and construction, felt and gravel roofing. Store fronts and fixtures. Excavating done.

Warehouse, cost $60,000, Ladenhurst St., for Labatt Brewing Co. Architect, C. F. Wagner, 15 Toronto St. Mason, Teagle & Son, 55 Boswell Ave. Two storeys, 90 x 140, brick and mill construction, cement foundation.

Addition to store and bakery, cost $3,000, for W. Dole, Follis & Bathurst Sts. Architect, H. G. Paull, 395 College St. General contractor, E. C. T. Dole, 414 Dupont St., will sublet plastering, painting, plumbing and heating. Two stys., 20 x 50, brick construction and foundation, felt and gravel roofing, gas and electric lighting, maple and oak floors, store fronts and fixtures, mantels, built in fireplaces.

Two stores and apartments, cost $10,000, Oakwood and St. Clair. General contractor and owner, Jas. Crang, 906 St. Clair Ave. General contractor sublets. Two storeys, 37 x 68, brick construction and foundation.

Stable, cost $6,000, Roselawn Ave., for International Constr. Co., 2261 Yonge St. Architect, W. H. Mallory, 31 Queen St. W. General contractor, Owner. Will sublet tile work. Wood and tile construction.

Store and residence, cost $5,000, cor. Sumach and David streets. Owner and general contractors, Bernstein Bros., 134 Sackville street. Work being done by day labor. Two storeys, 18 x 50, brick construction and foundation, felt and gravel roofing, store fronts and fixtures.

Four stores and residences, 387-91 Donforth ave. Owners and general contractors, Weismiller & MacKenzie Bros. Ltd. 1431 Queen street west. Two storeys, brick construction, felt and gravel roofing. Foundations in.

Winnipeg, Man.

Bank building, Elmwood, for Bank of Nova Scotia. Architects, Jordan & Over, Canada Life Bldg. General contractor, Major Schurman, 34 Canada Life Bldg.

Warehouse and factory, cost $200,000, for Smart Woods Co., Ltd., Alexander Ave. Architects, Woodman & Carey, Lindsay Bldg. General contractors, G. H. Archibald & Co., Union Bank Bldg. Two freight elevators, fireproof doors, office fixtures, grille work, vaults, boilers, bag making machinery required.

Office and cafe, Smith St., for Olympia Cafe Co., 277 Portage Ave. Architects, Jas. Chisholm & Sons, Enderton Bldg. General contractors, Carter-Halls-Aldinger Co., Union Bank Bldg., Winnipeg. Building will be completed this year. Six storeys, 110 x 120.

Residences

Ft. William, Ont.

Residence, cost $7,000, Norah St. S., for W. H. Scott. Architects, Carson & Smithley, Murray Block. 2½-storeys, 42 x 36, brick veneer construction, stone and cement foundation. Plans ready.

Ottawa, Ont.

Residence, cost $4,000, Preston St., for Fred Hunt, 801 Carling. Two storeys, 42 x 24, frame construction, concrete foundation. Plans in progress.

Montreal, Que.

Four flats, cost $7,000, Maisonneuve (Adam), for Victor Bernier, 746 Adam St. Will build in spring. Three stys., 25 x 53, cement and stone foundation, frame and brick construction. Plans being prepared.

Semi-detached residence, cost $15,000, Westmount, for H. E. Plant, 112 St. Matthew St. Builders, general contractors and masons, Jno. Quinlan & Co., 4414 St. Catherine, W. Carpenter, D. M. Long, rear 39 Windsor. Steel, Dom. Bridge Co., Dom. Express Bldg. Tenders will be received shortly for roofing, plastering, painting, heating, plumbing and electric.

Flat, cost $5,000, Maisonneuve (Boubonniere), for Ferdinand Servant, 1039 Orleans. Two storeys, 25 ft., 22½x 35, stone and cement foundation, frame and brick construction.

Six flats, cost $$.500, Des Erables, for C. Beaudoin, 724 Des Trables. Three storeys, 50 x 67, stone foundation. Plans in progress.

Flats, cost $6,000 , Maisonneuve (Adam), for Jos. Lachapelle, 417 Orleans. Three storeys, 25 x 55, concrete and stone foundation, frame and brick construction, felt and gravel roofing, galvanized iron cornices. Plans in progress.

Ottawa, Ont.

Residence, cost $14,000, McKay, for A. Bioskinsky, 298 Murray. Brick, construction, stone and concrete foundation, felt and gravel roofing. Plans in progress.

Regina, Sask .

Residences, cost $20,000, for D. P. McColl, 2043 Rose St. Architects, Storey & VanEgmond, Credit Foncier Bldg. 2½-storeys, brick foundation and construction. Plans in progress.

Residence, cost $15,000, for H. M. McCallam. Architects, Storey & VanEgmond, 1 Credit Foncier Bldg. Two stys., brick and stone construction, brick foundation. Plans in progress.

Toronto, Ont.

Two residences, Shudell Ave. and Seymour, for P. W. T. Ross, 167 Howland Ave. Tenders received at once, for masonry, etc.

One detached residence, cost $7,000, Schofield Ave., planned for Dr. A. D. A. Mason, 2 College St. Architect, J. H. Stanford, Bloor and Ossington. Tenders received by Owner. 2½-storeys, 30 x 40, brick foundation, stone and brick construction. Honeywell heating system.

CONTRACTS AWARDED

Brantford, Ont.

Residence, cost $3,500, Roberts ave., for Cobden E. Kitchen, 75 Grand street. General contractor, John Richards, 115 Spring street. Two storeys, 27 x 35, Ragstaff brick construction, stone and concrete foundation, shingle on asbestos roofing.

Bridgeburg, Ont.

Residence, cost $6,000, Niagara St., for A. B. Hurrell. General contractors and carpenters, Benner & Davis. Mason, Louis B. Wendz. 2½-storeys, 30 x 40, brick veneer construction, cement foundation. Excavating done.

Canora, Sask.

Six residences, cost $12,000, for Terminal Cities Co., 207 Farmer Bldg., Winnipeg. Company's architect prepared plans. General contractors, Hanks & Bertram. 1½ storeys, 20 x 24, frame construction, stone foundation, spruce and B. C. fir floors.

Edmonton, Alta.

Apartments, cost $75,000, Jasper Ave. Owners and general contractors, Cannell & Spencer, Alberta Block. Heating and plumbing, Installation Co., Ltd. Elec., Burnham Frith Elec. Co., Rice St. Six storeys, 54 x 50, brick and structural steel construction, cement foundation. General Contractor doing all work except heating and electric.

Halifax, N.S.

Residence, cost $3,500, Summit, for J. Burbridge, 226 West Young St. Builders and general contractors, Gray & Flinn, 92 Charles St. Two storeys, 25 x 45, cement foundation, frame construction.

Hamilton, Ont.

Three residences, cost $9,000, Arkledun ave. Owners and general contractors, Hamilton Building & Real Estate Co., 37 James St. S. Brick construction, stone foundation, shingle roofing. Permit issued.

Residence, cost $6,000, for E. Carlton, Balmoral Hotel. Architects, McPhie, Kelly & Darling, Bank of Hamilton Bldg. Carpenter, W. H. Bryant, 18 Clyde St. Masons, Yates & Randall. Other contracts not yet awarded. 2½-storeys, 33 x 40, stone foundation, pressed brick construction. Foundations in.

Montreal, Que.

Two residences, cost $20,000, Vendome. Architects and general contractors, Raoul Aubertin Co., 85 Monk Blvd. Tenders received by Owner. Two stys., 50 x 50, brick and stone construction, concrete foundation. Excavating done.

Three flats, cost $7,000, St. Hubert, for Jno. Vaughan, 1369 St. Hubert. Architect and general contractor, W. R. Boon, 2212 Mance St. Three storeys, 24 x 50, concrete foundation, brick construction. Excavating started.

Residence, cost $25,000, Pine Ave., for J. A. Trudeau, 22 Notre Dame E. Architect, Wilford Gagnon, 1002 New Birks Bldg. Brick, concrete and steel, Jno. Quinlan & Co., 4414 St. Catherine W. Carpenter, Alp. Bonin, 194 Adam. Roofing, heating, plumbing and electric, Jos. Belisle & Frere, 808 Papineau Ave. Painting, Z. Lapierre, 259 de Montigny E.

Four flats, cost $5,000, Christopher Columbus. Owner and general contractor, Saloator Ricie, 1753 De Chateaubriand Ave. Three storeys, 25 x78, concrete foundation, brick construction.

Five flats, cost $4,800, St. Dominique. Owner and general contractor, O. Lavoie, 579 Casgrain. Three storeys, 25 x 40, concrete foundation, brick construction, corrugated iron roofing. Permit issued.

Six flats, cost $8,000, 9th Ave., Rosemount, for J. E. Robin, 589 9th Ave., Rosemount. Builder and general contractor, Owner. Three storeys, 38 x 44, brick construction. Mr. Robin is building flats all the time—at the rate of about 50 per year.

Three flats, cost $5,000, Maisonneuve (Orleans), for Wm. Jacob, 434 Orleans. Architect and builder, Owner. Three storeys, 30 x 38, stone and cement foundation, frame and brick construction.

Cottage, cost $5,000, Maisonneuve (Sherbrooke), for J. P. Heroux, 212 Pie IX, Maisonneuve. Architect and builder, Owner. Two storeys, 24 x 38, cement and stone foundation, frame and brick construction.

Five flats, cost $4,000, Chambly. Owner and general contractor, Donat Lamonde, 283 Chamly. Three storeys, 23 x 40, concrete foundation, brick construction, felt and gravel roofing. Permit issued.

Residence, cost $10,000, Owners and general contractors, Martel & Leduc, 447 Outremont ave. Two storeys, 36 x 44, cement foundation, pressed brick construction. Excavating done.

Flats, cost $4,000, Viauville. Architect and general contractor, A. Choquette, 170 Bourbonniere. Three storeys, 25 x 50, concrete foundation, brick construction, felt and gravel roofing. Excavating done.

Cottage, cost $6,000, Rochameault, for H. Corbeil, 1506 St. Dominique. General contractors, A. Choquette, 170 Bourbonniere, will receive private tenders for all trades. Two storeys and basement, 30 x 32, Montreal stone foundation, brick construction, felt and gravel roofing.

Montreal West, Que.

Residence, cost $8,000, for Peden & McLaren, 20 St. Alexis street. Builder, Mr. Garrigan, Brock ave. Two storeys, and basement, 28 x 55, cement foundation, encased brick construction.

Ottawa, Ont.

Residence, cost $10,000, Echo St., for Geo. Gray, Marlboro Ave. General contractor, Alex. Christie, 359 Elgin St. Brick veneer construction, stone foundation.

Residence, cost $4,000. Owner and general contractor, W. O. Spearman, 32 Barton St. Brick veneer construction, stone foundation. Excavating started.

Residence, cost $8,000, Oxford. Owner and general contractor, Theo. Dean, Westboro, P. O. Two storeys, stone foundation, brick construction, felt and gravel roofing.

Residence, cost $11,000, Daly Ave., for Col. Sherwood, Daly Ave. Architect, C. J. Burritt, 193 Sparks St. Mason, Murphy Bros., Arthur St. Carpenter, Ferguson & Lambert, c/o Architect. Excavating done.

Quebec, Que.

Residence, cost $3,000. Owner and general contractor, Pierre Roberge, 144 8th ave., Limoilou. Three storeys, 35 x 28, concrete foundation, frame, red and Scotch brick construction, felt and gravel roofing. Work by day labor. Excavating done.

Residence, cost $7,000, 3rd ave., Limoilou, for Mville Racine, 220 1st ave., Limoilou. Architect, general contractor and carpenter, Art. Belanger, 22 Smith St. Other contracts will probably be done by day labor. Three storeys, 40 x 40, 12 x 12, stone foundation, Scotch brick construction.

Residence, cost $3,000, 8 Latourelle, for Louis Gagnon, St. Pierre Island of Orleans. General contractor, Nap. Ferland, 410 St. Francois, does all the work. Three storeys, 30 x 18, concrete foundation, frame, red and Scotch brick construction, felt and gravel roofing.

Port Arthur, Ont.

Residence, cost $5,500, Ambrose, for Geo. F. Foote, 64 Cumberland St. S. Builders and general contractors, Cox & Jones. Heating and plumbing, J. W. Barnes & Co. Two storeys, 26 x 34, red clay brick construction.

Qu'Appelle, Sask.

Residence, cost $5,000. Owner and general contractor, Chas. Hamilton. Brick construction and foundation. Excavating started.

Rosemere, Que.

Country residence, cost $25,000, for Jas. W. Domville, 183 Hutchison, Montreal. Architect, Wilford Gagnon, 1002 New Birks Bldg., Montreal. General contractor, Jacob K. Hanson, 3055a St. Dominique, Montreal. Concrete foundation, shingle roofing, field stone construction. Excavation started.

Sackville, N.B.

Residence, Charlotte, for Walter Ward. Builder and general contractor, Jas. A. Hicks. Masonry, carpentry, roofing, painting, builder. Heating, plumbing & electrical work, T. R. Ehrhardt & Sons. Two storeys, 23 x 28, cement foundation, frame construction.

Toronto, Ont.

Residence, cost $6,000, Foxley ave., for Architect (in trust) W. H. Mallory, 31 Queen street west. General contractor, P. W. Coltman, 167 Robert street. General contractor sublets. Three storeys, brick and frame construction.

Residence, cost $26,000, Russell Hill Road, for Jas. Hardy, c/o architects, Wickson & Gregg, 156 Yonge street. Masonry, Witchall & Son, 163 Havelock. 2½ storeys, 51 x 59, brick and stone construction, stone foundation.

Nineteen residences, cost $50,000, Boon ave. Owners and general contractors, J. W. & J. S. Rankin, 243 St. Clarens ave. Day labor. Walls up on one pair; foundations in for four pair. Excavation out for balance. 2½ storeys, 21 x 44, brick foundation, brick construction.

Residence, cost $10,000, Wells Hill. Architect, W. H. Mallory, 31 Queen St. W. General contractor, P. W. Coltman, 167 Robert street. Masonry, A. A. Kitchen, 1285 Dufferin street. General contractor will sublet. Three storeys, stone and brick construction. Foundations started.

Four residences, cost $16,000, Lauder ave., for Dr. F. A. Sollery, 530 Bloor W. General contractor, J. S. Case, 148 Close ave. Mason, Thos. Sykes, 563 Brock ave. General contractor sublets. 2½ storeys, 17 x 42, brick construction. Foundations in.

Apartments, cost $48,000, King and Dufferin, for A. J. Rattray, architect, 123 Bay street (in trust). General contractor, C. Proctor, 38 Melbourne. Three storeys, 90 x 68, concrete and brick foundation, stone, brick and steel construction, felt and gravel roofing. Excavating started.

Residence, cost $5,000, Pricefield Road, Owner and general contractor, Jos. Williams, 303 Dovercourt Rd. Owner will sublet. 2½ storeys, 24 x 36, brick construction, brick foundation.

Two residences, cost $4,600, Arundel ave., for Geo. Sheppard, 154 Arundel. General contractor, J. M. Walker, 721 Carlaw ave. 2½ storeys, brick construction and foundation, shingle, felt and gravel roofing. Foundations started.

One detached residence, cost $4,000, Glencairn. Owner and general contractor, F. D. Parmenter, 454 Gladstone ave. Work by day labor. 2½ storeys, 30 x 35, brick construction and foundation, shingle roofing.

Rectory, cost $12,000, First ave. and Degrassi street, for Rev. Thos. O'Donnell, 240 Bolton ave. Architect, A. W. Holmes, 10 Bloor St. E. General contractor, W. A. McNeil, St. Mary's, Ont. Toronto office, Gerrard and Degrassi streets. 2½ storeys, 32 x 44, stone, steel and brick construction. Stone foundation, gas and electric lighting, hot water heating, oak and maple floors, lime and sand plastering.

Residence, cost $7,500, 81 Wells Hill, for F. W. Warren, 58 Hilton avenue. Carpentry, Wallace & Page, 25 Radenhurst. Plastering, Page Bros., c/o 81 Wells Hill. Heating, A. Clark, 7 Follis ave. Plumbing, W. N. Atkins, 25 Hocken ave. Electrical not let. Gas and electric lighting, hot water heating. 2½ storeys, 22 x 36.

Four residences, cost $4,500 each, Kennedy and Barrie. Owner and general contractor, D. J. Tuck, 1012 Bloor St. W. Masonry, day labor. Roofing, R. Rennie & Son, 130 Dupont street. Plastering, Mr. Morris, 454 Roxton Rd. Heating & plumbing, C. B. G. Reid, 194 Jones ave. Two residences, plastering and two foundations in. 2½ storeys, brick construction, slate, felt and gravel roofing.

Vancouver, B.C.

Residence, cost $10,000, Shaughnessy, for R. S. Gordon. Architect, David Blair, 522 Pender street. General contractors, Stephen & Whittacker, 1116

(Continued on page 75)

Tenders and For Sale Department

NOTICE

Extension of Time

Town of Neepawa, Manitoba

Tenders for Machinery

Sealed tenders will be received up to noon, **Friday, Sept. 12, 1913**, for machinery for additions to the power plant at Neepawa, as follows:—

Specification Section No. 1—Two 72-in. x 18-ft. Boilers.

Specification Section No. 2—One 187½ h.p. Engine.

Specification Section No. 3—One 150 k.v.a. Generator, Switchboard, etc.

Specifications may be seen at the offices of the Electrical News, or obtained from W. F. Skinner, Limited, 204 Sterling Bank Bldg., Winnipeg, or from the undersigned:

J. W. BRADLEY, Sec.-Treas.,
Neepawa, Man.

F

Sealed tenders addressed to the undersigned, and endorsed "Tender for Extension and Repairs to Revetment Wall at Meaford, Ont.," will be received at this office until 4 p.m. on **Monday, September 29, 1913**, for the construction of an Extension and repairs to the Revetment Wall at Meaford, Grey County, Ont.

Plans, specifications and form of contract can be seen and forms of tender obtained at this Department and at the office of J. G. Sing, Esq., District Engineer, Confederation Life Building, Toronto, Ont.; J. H. Armstrong, Esq., District Engineer, Midland, Ont., and on application to the Postmaster at Meaford, Ont.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, August 27, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—46238 36-37

TOWNSHIP OF BRANTFORD

Cement Sidewalks

Sealed tenders will be received up to **Saturday, Sept. 13th, 1913**, at the office of the Township Clerk, County Buildings, Brantford, for the construction of 4,053 ft. of four-foot cement sidewalk.

Tenderers are expected to look over the site of the work before putting in their bids.

Plans and specifications may be seen at the office of the undersigned.

Tenders must be accompanied by marked cheque for $200 payable to the Township Treasurer.

Lowest or any tender not necessarily accepted.

ALAN MAIR JACKSON,
Township Engineer.

37

Sealed tenders addressed to the undersigned and endorsed "Tender for Interior Fittings, Post Office, Port Arthur, Ont.," will be received until 4 p.m. on **Thursday, September 18, 1913**, for the work mentioned.

Tenders will not be considered unless made upon forms furnished by Department, and in accordance with conditions contained therein.

Plans and specifications to be seen on application to Mr. D. McKenzie, Caretaker, Port Arthur, Ont.; Mr. T. A. Hastings, Clerk of Works, Postal Station "F," Toronto, Ont., and at the Department of Public Works, Ottawa.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, August 30, 1913.
—47186. F

Tenders Wanted

Sealed tenders will be received up to noon on the **16th day of September, 1913**, by the undersigned at Cayuga, Ontario, for the construction of twenty-six and one-half miles of stone macadam road in the County of Haldimand.

The work will be let in three separate and distinct contracts, not necessarily to the same individual.

Tenderers are required to examine the localities of the work and are required to be present at the opening of the tenders at 2 p.m. on Wednesday, the 17th day of September, 1913.

Plans and specifications may be seen at the office of the County Engineers, Messrs. Jackson & Kyd, Dunnville, or may be had from them on the payment of $10, which sum will be refunded on return of the documents.

Lowest or any tender not necessarily accepted.

T. A. SNIDER, K.C., County Clerk,
County of Haldimand,
Cayuga, Ont.

32-37

TENDERS

FOR

Fire Alarm Boxes, One Ten Circuit Protector Board, One Eight Circuit Storage Battery Board, One Motor Generator Set, Three Full Joker Sets, Copper Wire, etc.

Tenders addressed to the undersigned will be received by registered post up to noon on

Tuesday, September 23, 1913.

for supplying the above named articles.

Specifications and forms of tender, together with the conditions governing tenders, as prescribed by city by-law, may be obtained at the office of the Fire Department, No. 152 Adelaide street west, Toronto.

The lowest or any tender not necessarily accepted.

H. C. HOCKEN, Mayor,
Chairman Board of Control.

Toronto, Sept. 3, 1913. 37-37

Proposed Government Buildings

OTTAWA, ONTARIO

Architects are invited to submit sketch designs in a preliminary competition for the erection of Departmental and Courts Buildings.

From the designs submitted in this preliminary competition, six will be chosen by the Assessors the authors of which will be invited to submit more matured designs in a final competition, for which the five unsuccessful competitors shall each receive an honorarium of Three Thousan Dollars ($3,000).

The author of the design placed first by th Assessors will be entrusted with the work whic the Government intends carrying out at once.

The competition is limited to British subjects practising in the British Empire.

The Government has appointed Mr. T. E. Coll cutt, Mr. J. H. G. Russell, and Mr. J. O. Ma chand, as Assessors to act in its behalf.

The design in the first competition must b delivered in Ottawa (carriage paid) not late than 12 o'clock noon, 2nd January, **1914**, addressed to the undersigned.

Conditions for both competitions may be had on application to the undersigned, and at th office of the High Commissioner for Canada, 17 Victoria Street, London, England.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, August 18, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department 44890 36-37

Special Notice

Every man who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works are advertised.

Send along your plans when asking for tenders put a line in your advertisement to that effect.

No extra charge is made for filing plans at one or all four offices.

Contract Record and Engineering Review

Montreal—119 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—429 Pender Street.

Power Plants, Electricity and Telephones

(Continued from page 73)

Hamilton, Ont.
Underground conduit system, cost $177,822, for Hydro Electric Department. Mayor, John Allan. Engineer, E. J. Sifton. General contractor, G. M. Gest, 502 Power Bldg., Montreal. Above cost does not include wiring. Part of cost to be borne by the Cataract Power & Telegraph Companies.

Montreal, Que.
Transformer house, cost $5,000, Verdun, for Montreal Water & Power Co., Quebec Bank Bldg. Architect, Owners. General contractors, A. F. Byers & Co., 340 University Ave., open to receive tenders for roofing, concrete foundation, brick construction, copper roofing.

Port Henry, Ont.
Wireless Telegraph Station planned by Dom. Govt., Dept. of Marine & Fisheries. Secretary, Alex. Johnston, Ottawa. Station to be erected 300 ft. northwest from above location for purposes of forming a connecting link between Montreal on the east and Toronto on the west, in a chain of stations reaching across Canada from Labrador to Vancouver. Site secured, work to start shortly.

Shawville, Que.
R. A. Lister & Co., Ltd., 53 Stewart St., Toronto, have been awarded the contract for the installation of an additional automatic electric lighting plant of 6 kw. capacity, to be Lister Bruston automatic type, same as the first plant.

Toronto, Ont.
Transformer station, cost $35,000, Ft. Strachan ave., for Hydro Electric Power Commission, Continental Life Bldg. Architect, company's engineer. General contractors, Witchall & Son, 163 Havelock street. Brick, stone and steel construction.

Winnipeg, Man.
Addition to power house, cost $35,000, River street, planned by Board of Control. Secretary, M. Peterson. Engineer, J. G. Glassco, 54 King street. General contractors, Fort Garry Construction Co. Ross & Arlington. Heating, Charette Kirk & Co., St. Boniface. Foundations in.

Business Notes

Belleville, Ont.
Queens Hotel stables, Temperance Hotel stables, C. Owens livery stables destroyed by fire. Loss $15,000.

Inverary, Ont.
Cheese factory owned by the Model Cheese Co., burned. Loss $3,000; insurance $3,000.

Montreal, Que.
Cabinet works owned by Smith Estate, c/o Mr. Gallagher, 957 St. James St., damaged by fire. To be replaced by owners.

Rosthern, Sask.
Machine and blacksmith shop owned by Philip Kenzel, Strathcona ave., burned. Loss $5,000.

Miscellaneous

Calgary, Alta.
Fire apparatus, cost $52,000, contemplated by the City Council. Clerk, J. M. Miller. By-law to be voted on September 28th for motor pump and fire fighting apparatus.

Ottawa, Ont.
Cable required by Electrical Dept. Engineer, Supt. Brown, City Hall. Contract awarded to the Imperial Wire & Cable Co. of Montreal, for wiring for underground conduit system.

Regina, Sask.
City Council contemplate the purchase of new gasoline pump for fire department, recommended by Commissioner, L. A. Thornton. Chief of Fire Dept., A. J. White.

New Companies

Chats Falls Realty Company, Limited, has been incorporated with a capital of $50,000, to carry on business as a general land and building company, with head office at Ottawa. The provisional directors are G. P. Spittal, broker, T. A. Beament and A. H. Armstrong, barristers, all of Ottawa.

The Point Improvement Company, Limited, has been incorporated with a capital of $40,000, to carry on a general land and building business with head office at Windsor. The provisional directors are R. F. Hurst of the Township of Mersea, Edward Winter, agent of Leamington, and A. B. Drake, barrister, of Windsor.

Hepburn & Disher, Limited, have been incorporated with a capital of $150,000, to manufacture and deal in structural, ornamental and all other clases of iron, steel and metal work, with head office at Toronto. The provisional directors are C. E. Disher, engineer, J. T. Hepburn, machinist, and J. F. Boland, barrister, of Toronto.

The Ideal Electric Manufacturing Co., Ltd., has been incorporated with a capital of $40,000, to manufacture and deal in electric appliances of all kinds, with head office at London. The provisional directors are Jno. Sussex, R. J. Gracey, and W. A. Cooper, manufacturers, all of London.

Late News Items

Edmonton, Alta.
Residence, cost $5,000, for G. H. McDonald, King's Drive. Architects, Magoon & MacDonald, Tegler Block. General contractor, L. F. Kelsey, General Delivery. Two storeys, 25 x 34, brick and frame construction, concrete foundation. Two fireplaces. Excavating done.

Montreal, Que.
Machine shop planned between Guy and Beaver Hall Hill, St. James and St. Antoine for Estate J. K. MacDonald, 318 Craig W. Mr. D. A. MacDonald, of J. K. MacDonald Estate is looking for 3,000 feet of land on which to build or else would like to rent or buy two storey building.

Apartment house, cost $40,000, Lorne Crescent, for Hand & Pick, 609 Belmont ave., Westmount. Architect, D. J. Crighton, Jacobs Bldg., will receive tenders for reinforced or cement, 5 storeys, 58 x 71, concrete foundation, reinforced concrete, terra cotta and brick construction. Foundations in.

Semi-detached residence, cost $34,000, Westmount, Blvd. ave., for A. Racine, 340 St. Paul street. Architect, L. A. Amos, 78 Crescent. General contractors, Robertson Bros., Chestnut avenue. Two storeys and basement, 50 x 65, concrete foundation, pressed brick construction, galvanized iron cornices. Excavating done.

Ottawa, Ont.
Stores and offices, Rideau street, owned by J. B. Duford, painter, Rideau St., burned; loss $35,000. Will rebuild. Owner has several large contracts on hand at present and will require paints of all descriptions.

Petite Riviere East, Que.
Breakwater. Tenders received by Secretary, Dom. Govt., Dept. of Public Works, R. S. Desrochers, Ottawa, until Oct. 7th. Plans, etc., at office of J. T. Bertrand, Dist. Engineer, Isle Verte, J. C. Tache, Dist. Engineer, Rimouski, Postmaster at Petite Riviere and Dept., Ottawa.

AGENTS WANTED

High Class Artificial Stone Company requires agents in every city to sell building stone, ornamental work, pipes, roof and floor tiles, etc. Liberal commission allowed. Address C. F. c/o "Contract Record," Toronto.

36-37-38

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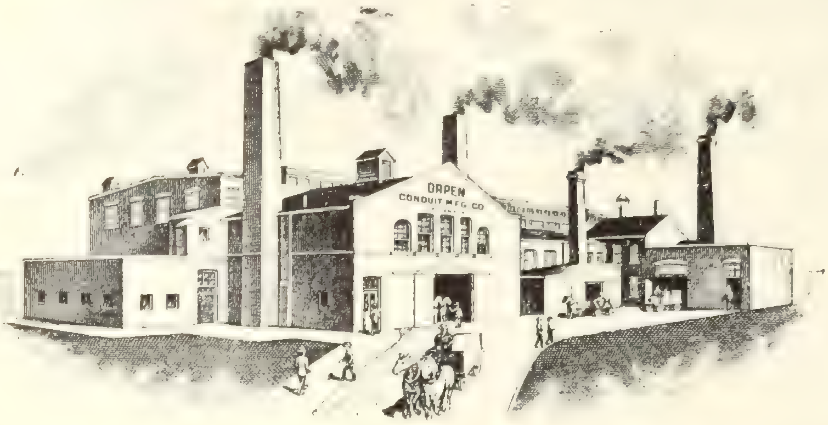

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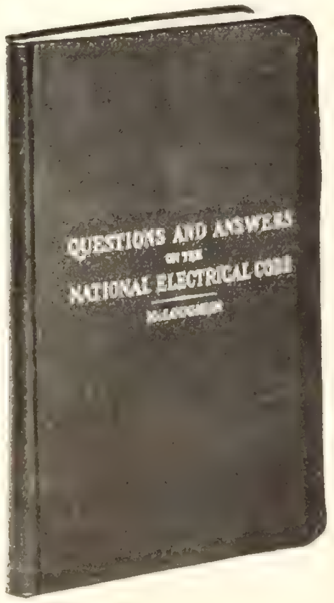
QUESTIONS AND ANSWERS ON THE NATIONAL ELECTRICAL CODE McLOUGHLIN

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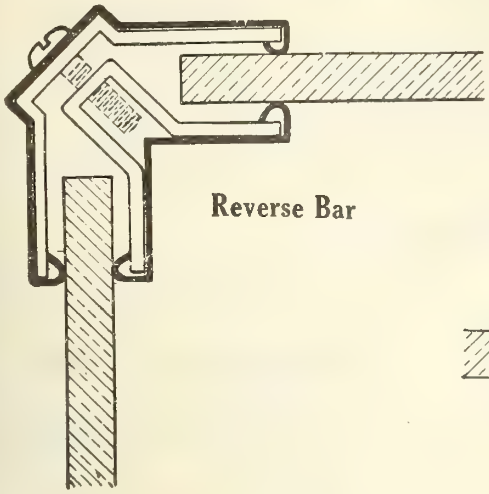
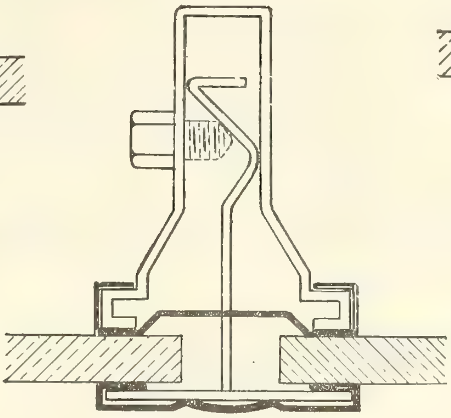
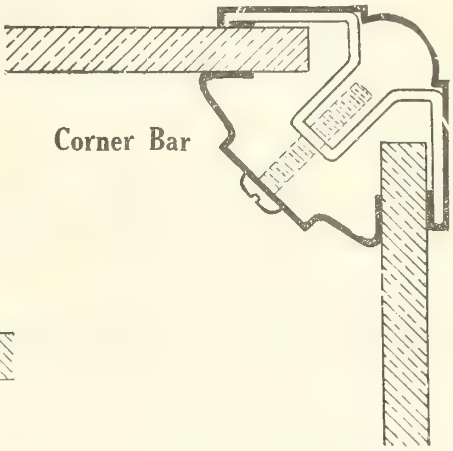

Reverse Bar


Division Bar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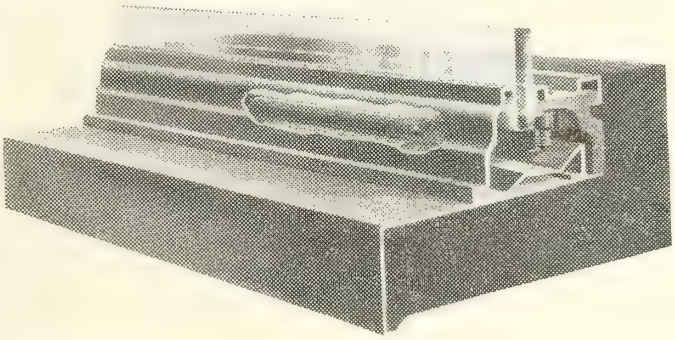

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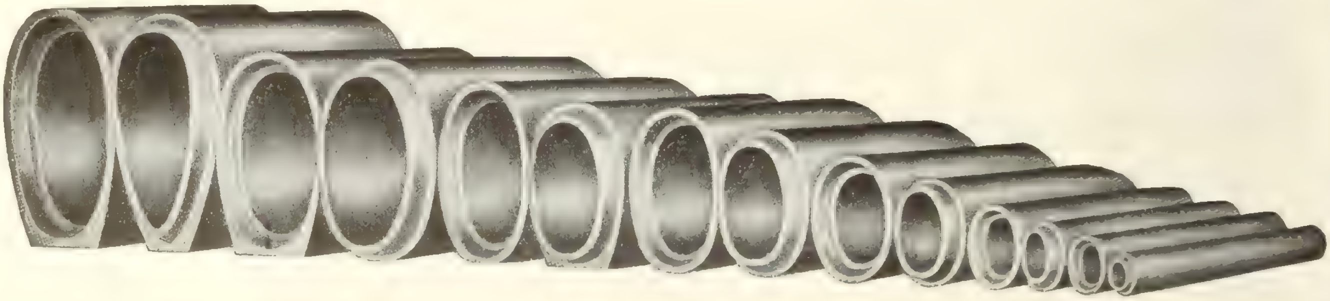

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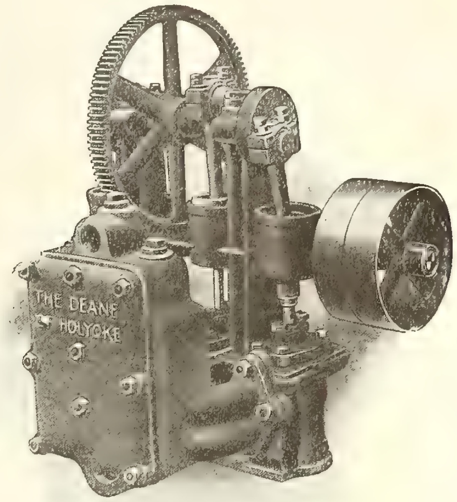

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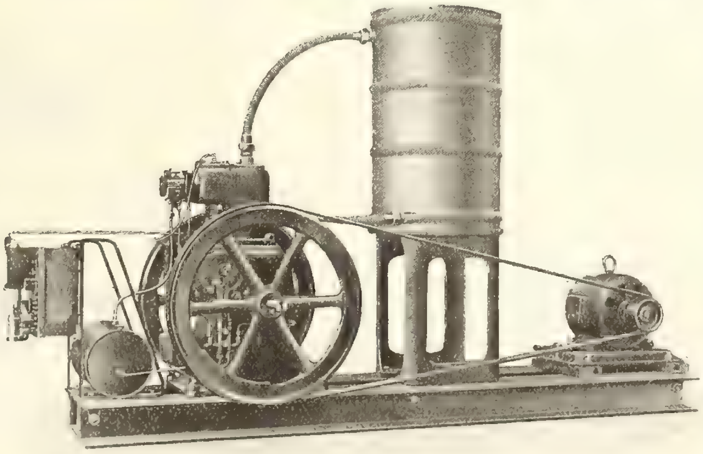

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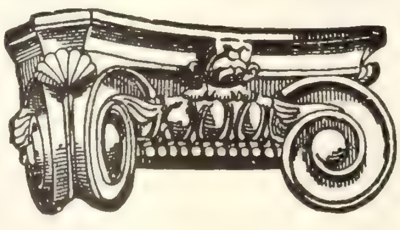

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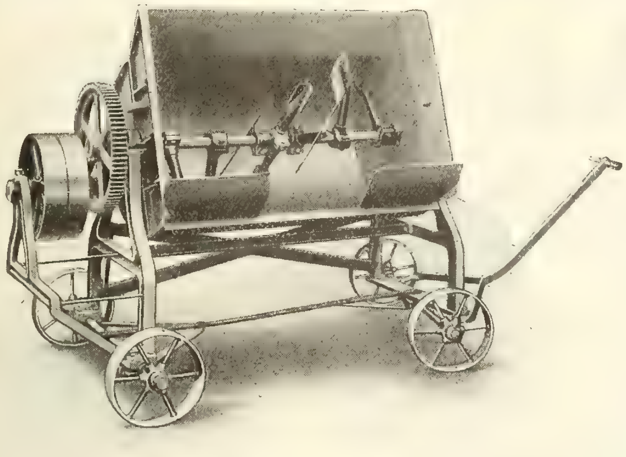

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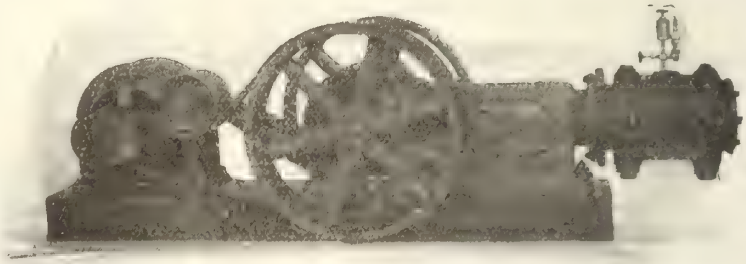

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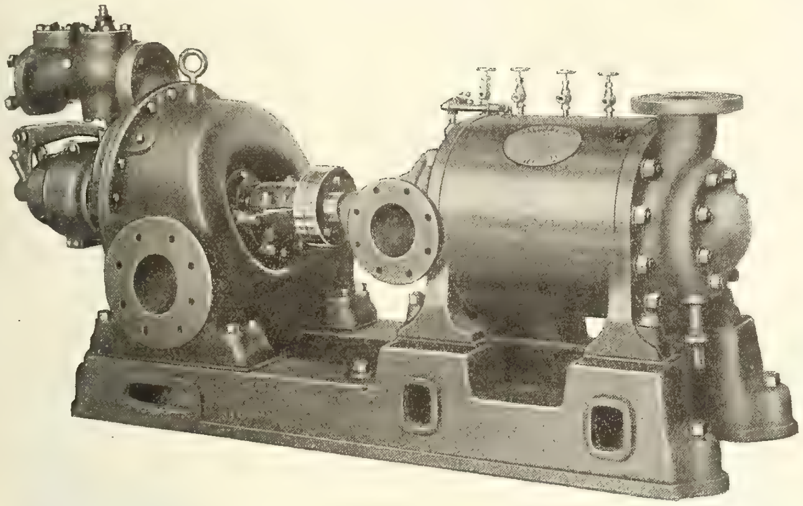

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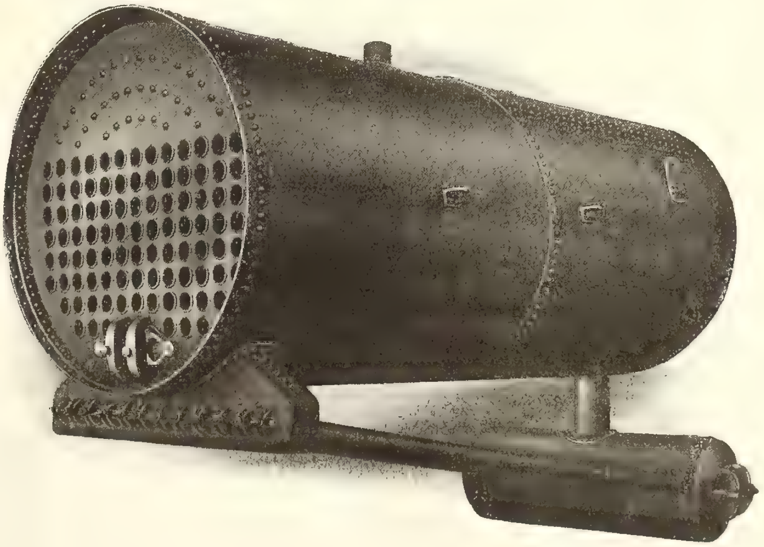

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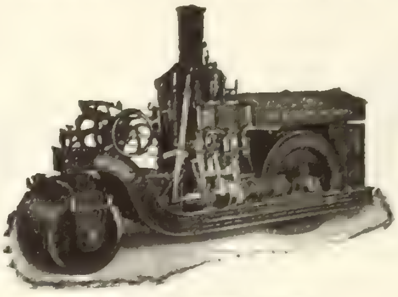

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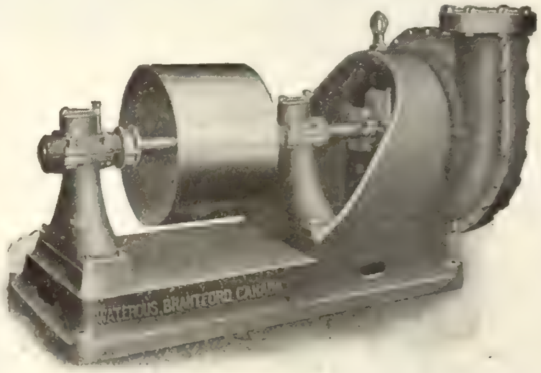

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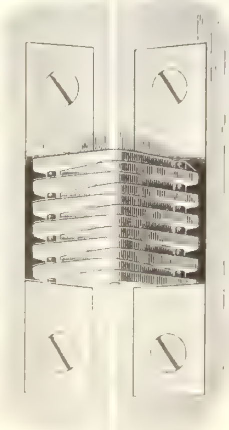

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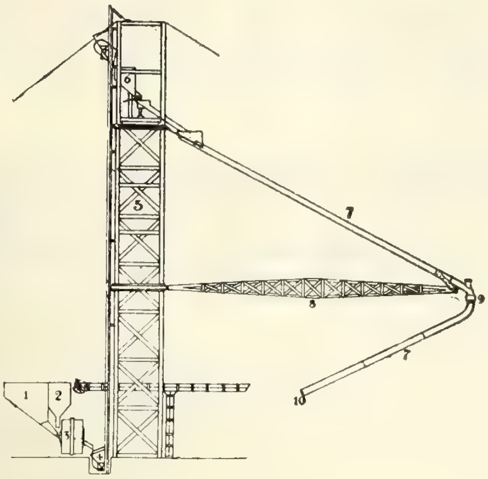

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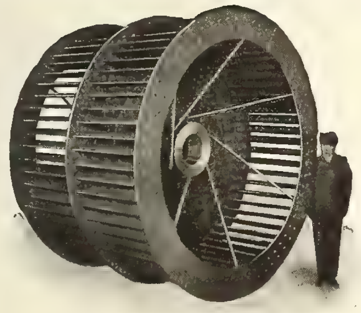

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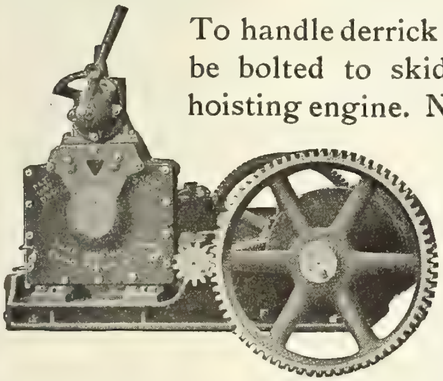

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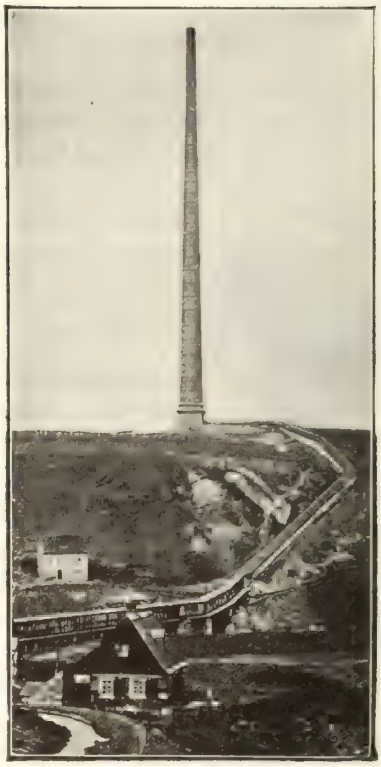

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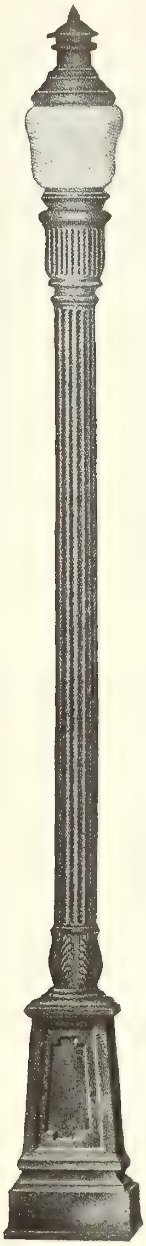

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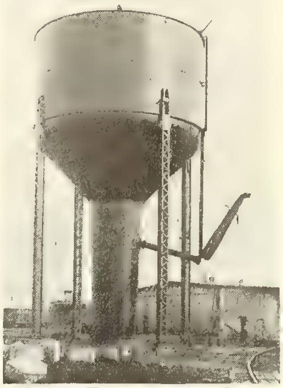

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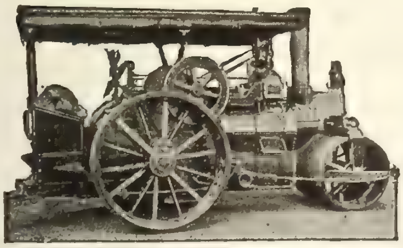

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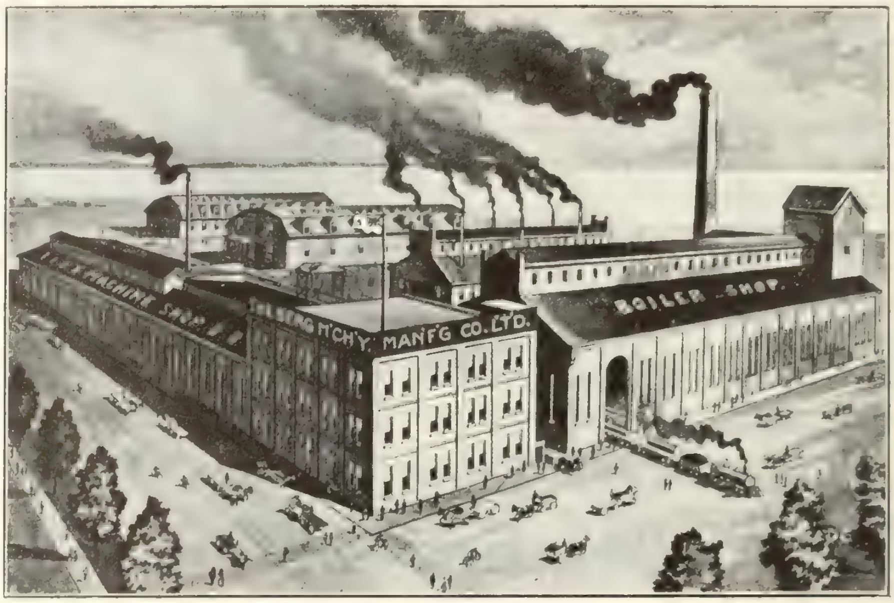

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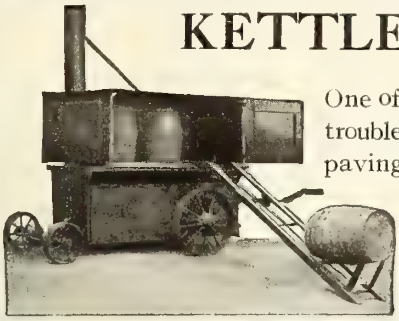

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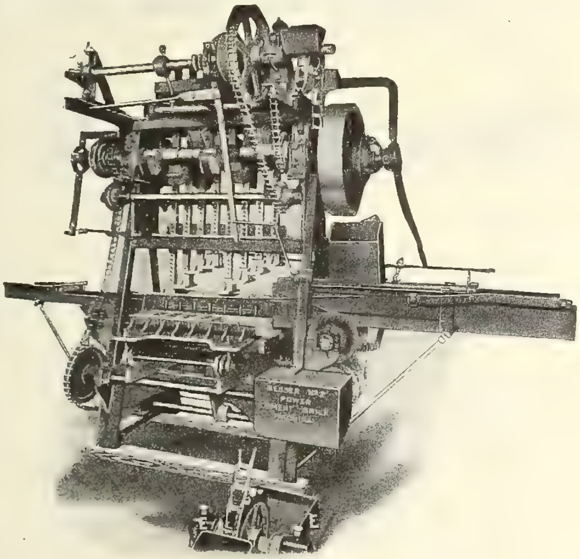

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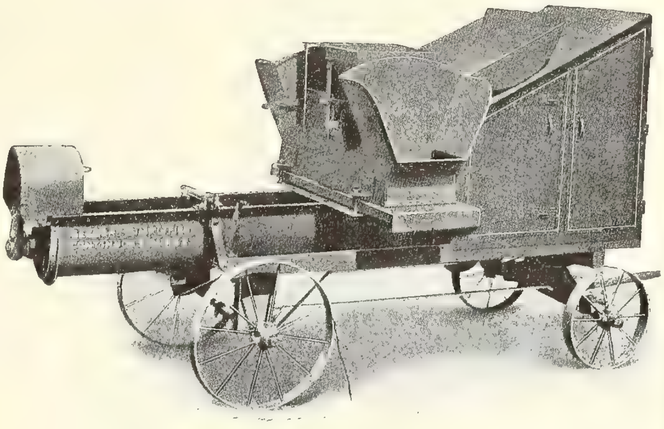

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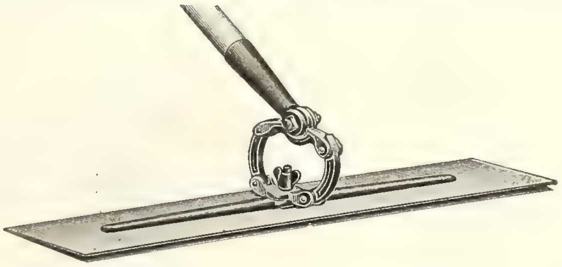

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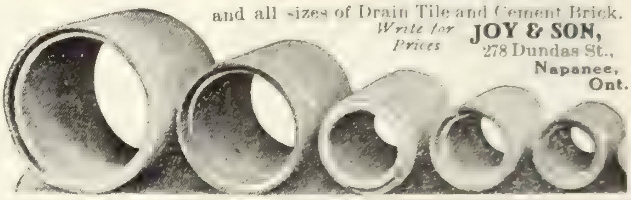

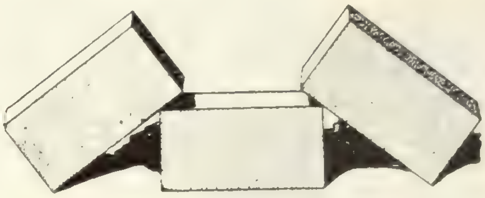

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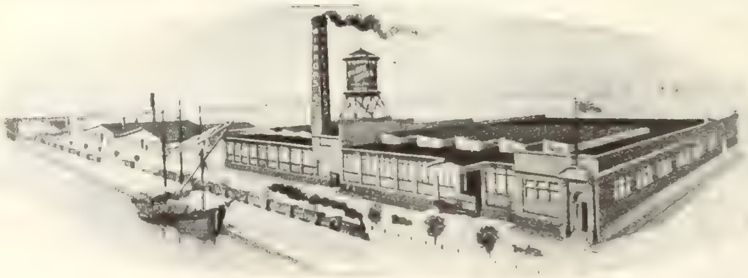

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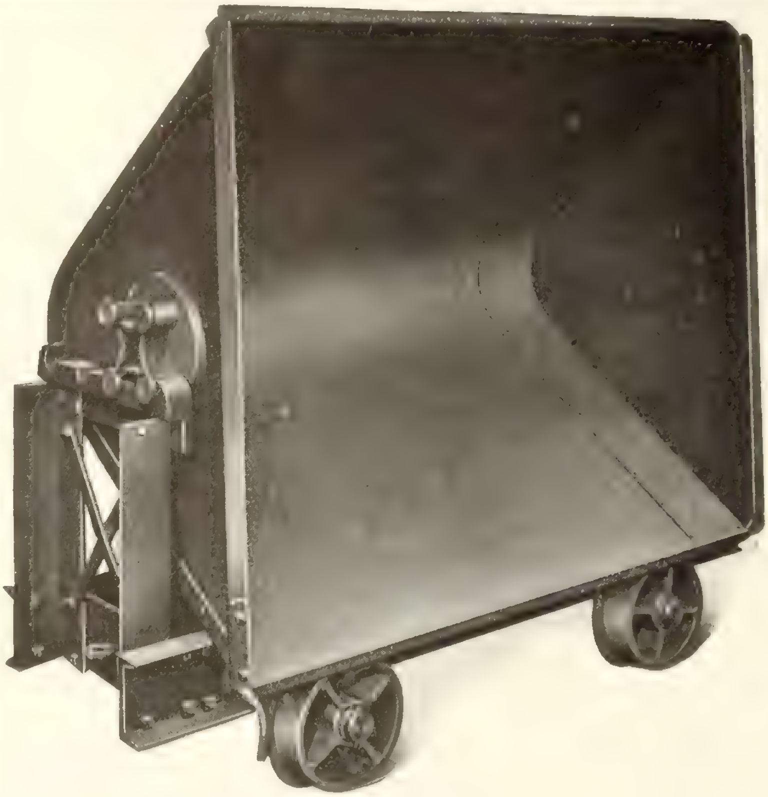

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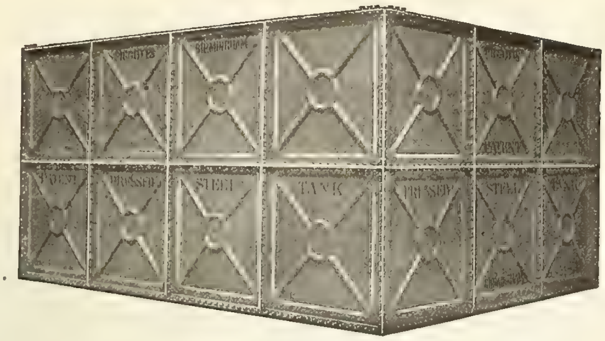

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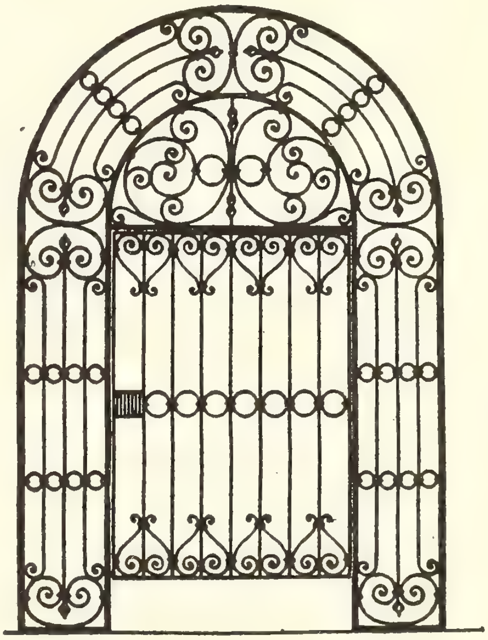

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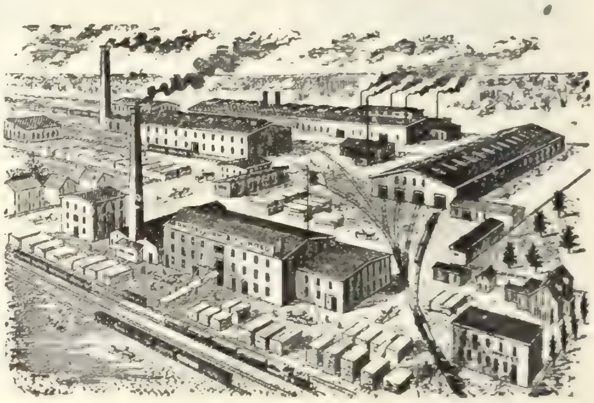

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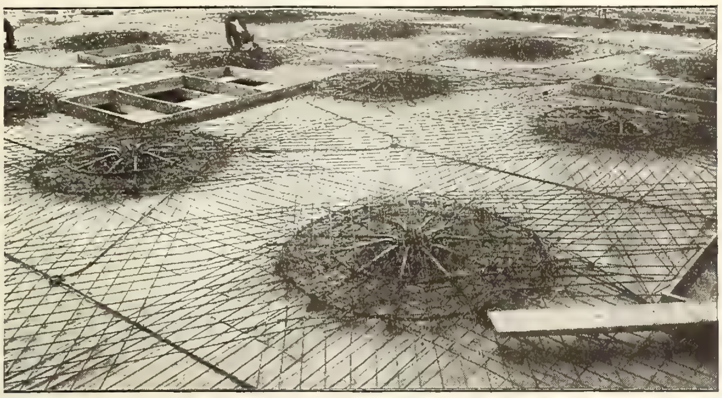

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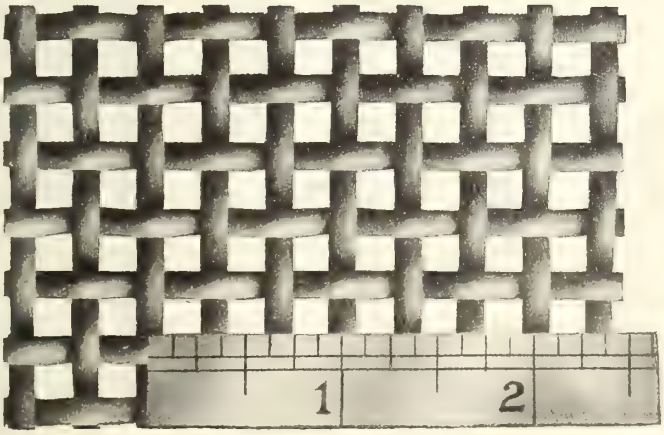

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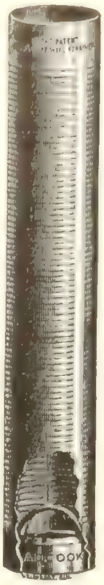

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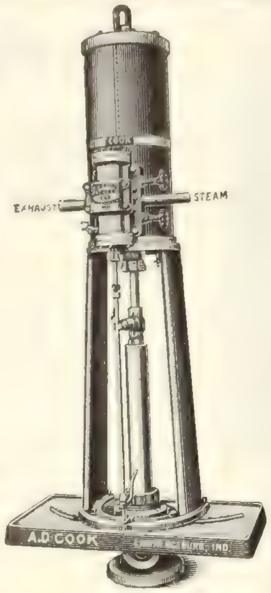

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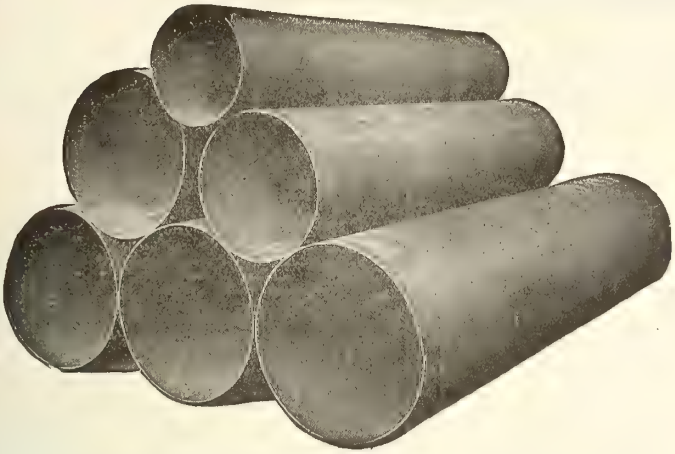

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Contractor for **Cold Storage Buildings, Abbatoirs, Creameries** and similar structures where the insulation or waterproofing requirements call for special attention.

F. W. THOROLD CO., LIMITED

CONSULTING ENGINEERS

CONTRACTORS

2 TORONTO STREET **TORONTO**

TRADE MARK
TAMCO

FOR SALE
"TAMCO" Crushed Stone in all sizes, for all purposes. "Roman" building stone. "Milton" pressed bricks. Sanitary flooring, stone crushers, fire engines, &c.
T. A. MORRISON & CO.
204 St. James Street,
Tel. Main 4532. Montreal.

Lawson, Welch & Company

CHARTERED ACCOUNTANTS.
TRUSTEES - FINANCIAL AGENTS
CROWN LIFE BUILDING.
JAS. F. LAWSON
HENRY J. WELCH
TORONTO.
[illegible]

CASTINGS

Gardner & Saxby

Engineers' Patternmakers, etc.

346 5th Ave. W., Vancouver, B. C.

The

Laurentian Granite Co.

Limited

MANUFACTURERS OF

Building Granite, Granite Setts, Curbing, Crushed Granite

Samples Furnished and Prices Quoted on Application

Rose and Pink Granite Quarries at Staynerville, P. Que., Co. Argenteuil, on C.P.R.

Bank of Ottawa Bld'g, 224 St. James St. **Montreal**
Bell Tel. M. 4354

STEEL & RADIATION LIMITED

Products all Made in Canada

Toronto, Ont. **Fenestra** SOLID STEEL WINDOWS Montreal, Que.

Steelcrete Concrete Reinforcing	Steelcrete Metal Lath	Steelcrete Steel Lockers

The Automatic Surveyor Level

Make your Preliminary Survey with the New

Dikeman Automatic Surveyor Level

Accurate results guaranteed.
Send for Circular.

Dikeman Surveyor Co., Detroit, Mich. Windsor, Ont.

MANUFACTURED BY
CANADIAN OFFICE-SCHOOL FURNITURE CO. LTD.
PRESTON - - - - - ONTARIO

Have Your Building Daylighted

WHILE it is not possible to have every part of every building daylight it is practical to have some portions of most buildings daylighted. The one best way to accomplish results in daylighting is by the use of

LUXFER PRISMS

These are made up of a number of accurate formed prismatic angles that are capable of refracting daylight and putting it where it is wanted.

Always specify the first and best prism—Luxfer

LUXFER PRISM COMPANY, Limited
100 King Street West, TORONTO

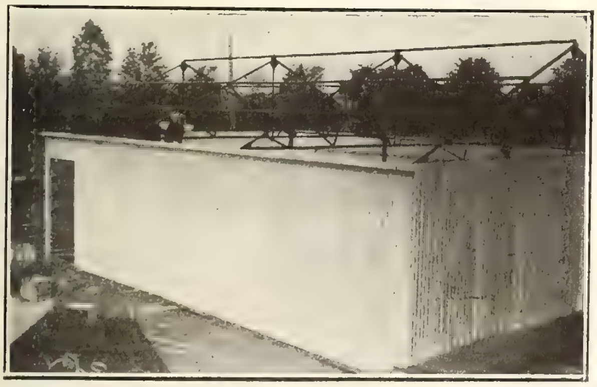
Storage Houses Oil Houses

¶ We have the best possible facility for making all kinds of storage houses of one storey, no matter of what dimensions.

¶ We will undertake to furnish and erect such buildings complete ready for occupancy.

¶ No steel building is too small or too large for us to figure on.

¶ We shall be pleased to furnish estimates and sketches on this class of work at any time. Write us and tell us what you need and we will prepare estimates for you at once.



Cut shows an all-steel building used for storing expensive patterns and dies. The size of this is 18′ x 39′ and it has been doing service for years and gives the same good service as when erected.

The Metal Shingle & Siding Company, Ltd.

Associated with
The A. B. Ormsby Company, Limited
Montreal, Saskatoon, Toronto, Edmonton, Preston, Winnipeg, Calgary.

STANDARD FIRE-PROOF DOORS

INSPECTED AND LABELLED UNDER THE DIRECTION OF THE UNDERWRITERS LABORATORIES (INC.)
SHEET METAL WORKERS, SKYLIGHTS, CORNICES AND WINDOWS.
LET US ESTIMATE ON YOUR NEXT REQUIREMENTS.

ALL OUR DOORS AND HARDWARE ARE LABELLED BY THE UNDERWRITERS.

FEATHER & ROADHOUSE SHEET METAL WORKERS
Phone Adelaide 2377 528 FRONT STREET WEST, TORONTO

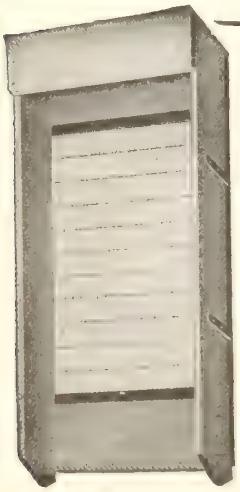
Roof Ornaments and Weather Vanes

Made specially in wrought iron or copper from Architects or our own designs

Dennis Wire & Iron Works Co.
London, Ont. Limited
Toronto Branch : 36 LOMBARD STREET

Dominion Marble Company
Limited
Montreal, Que.

SOLE producers of the Beautiful Royal Dominion marble quarried at South Stukely, Que. A card or 'phone call will bring our representative to submit figures on any class of marble work. Address all letters to the Company P.O. Box 1166, Montreal.



NOW is the time to renew your

SAND and GRAVEL SCREENS

We make **SCREENS** for all purposes

Concrete Reinforcement, Window Guards, General Wire and Ironwork.

Shall be pleased to quote you.

Canada Wire & Iron Goods Co.
Hamilton

Pioneer Manufacturer of

Hotchkiss Steel Forms

For walks—curbs—curb and gutter combined—driveways, roads, pavements, etc.

The benefit of 20 years experience as successful contractors.

Yours for the Asking

Hotchkiss Lock Metal Form Co.
BINGHAMPTON, N.Y.

We Manufacture

The Reliable Line of

VALVES

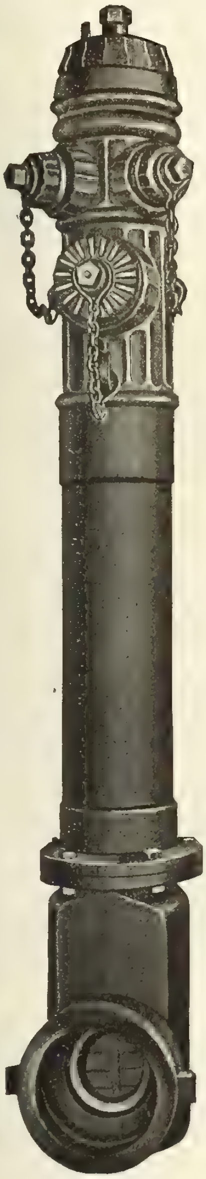
- Brass Globe and Gate.
- Steam and Hot Water.
- Packless Radiator.
- Iron Body "Keystone" Gate, (non-rising stem or outside screw and yoke, with screwed, flanged or hub end)
- Iron Body Swing Check.

Gate and Compression FIRE HYDRANTS

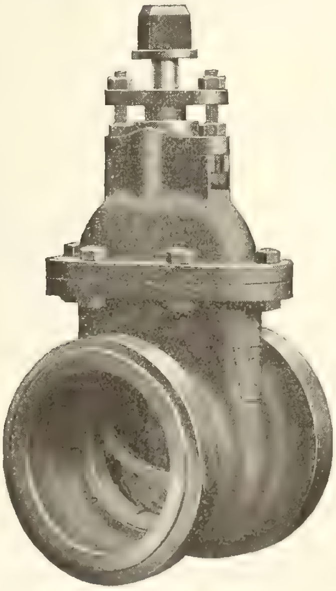
INDICATOR POSTS

CRANES FOR FILLING WATER CARTS

VALVE BOXES
Screw Adjustable or Slide Adjustable



Kerr Gate Hydrant.



6" Hub End Gate

Forty Years of Experience has much to do with the satisfaction these goods give our customers.

THE KERR ENGINE CO.
LIMITED
WALKERVILLE, ONT.

New Code Rubber Covered Wires and Cables

Manufactured in accordance with specifications of the National Board of Fire Underwriters.

All our new code wire is inspected by the Underwriters Laboratories Inc. and have their inspection tags attached.

Stock carried at Toronto, Montreal, Winnipeg and Vancouver.

Price list and discounts on application to head office or nearest agent.

Canada Wire & Cable Co., Limited
1160-1170 Dundas Street
Toronto Canada

Sales Agents

Roper Clarke & Co., Limited, 422 Coristine Bldg., Montreal; A.E. Esling 150 Princess St., Winnipeg; Macdonald, Marpole Co., Limited, Vancouver; Gorman, Clancy & Grindley, Limited, Calgary and Edmonton.

CRUSHED
STONE

PORTLAND
CEMENT

The Rogers Supply Co.
28 King St. West
Toronto
Telephone Exchange M 4155

Toronto Agents for Dundas and Vinemount Quarries

CLEAN STONE

Quick Deliveries
By
G.T.R., C.P.R. or Team

Current Prices of Building Material

BRICKS

The following are wholesale prices delivered at Toronto:—

	Per M
No. 1 dry pressed red brick	$18 00
No. 1 dry pressed buff brick	18 00
Red Stock Bricks	13 00
Grey Stock Bricks	13 00
Wire cut bricks for foundation work	12 50
Porous terra cotta bricks	15 00
No. 1 enamelled bricks, all colors, from	$80 00 to $150 00
Sand-Lime Bricks	11 00

LUMBER (Building Material)

Hemlock Lumber—

2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$26 00	
2 x 4 to 2 x 12, 16 ft.	26 00	
2 x 4 to 2 x 12, 18 ft.	29 00	
1 in. Hemlock, No. 1	25 00	27 00
No. 1 Hemlock Decking	25 00	27 00
No. 2 Hemlock dimension and 1-in.	19 00	21 00

Pine—

1 in. common pine 8 to 12 in. wide rough	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
⅞ x 8 and 10 in. pine shelving	36 00	42 00
⅞ x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine desking D2S	30 00	
Spruce Decking	28 00	
No. 1 pine V. or beaded sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	

Pine trim for paint finish—

4 in. casing per 100 ft.	2 00
5 in. casing per 100 ft.	2 50
8-in. pine base, per 100 ft.	3 50
10 in. pine base, per 100 ft.	4 50
4 in. pine window stool	2 75

Shingles—

XXX B. C. Clear Shingles per M.	3 90
N. B. Extras	3 75
N. B. Clears	3 10
No. 1 pine lath, per M.	5 00
No. 2 pine lath	4 50
No. 1 spruce lath	4 00

Cedar Posts—Fence -

5 in. at small end, each	30
7 in. at small end, each	35
Hemlock lath	3 50

Dimension Timber up to 32 feet:

8x8, 10x10, 10x12, 12x12, 12x14	32 00
8x10, 8x12, 10x14, 14x14	34 50
8x14, 12x16, 14x16, 16x16	34 50
10x16, 14x18, 16x18	35 50
8x16, 12x18, 18x18	36 00
10x18, 14x20, 16x20	36 50
8x18, 12x20, 18x20	37 00
10x20	37 50
8x20, 14x22, 16x22, 18x22, 20x22, 22x22	38 50
12x22	39 00
10x22	39 50
8x22, 14x24, 18x24, 20x24, 22x24, 24x24	40 50
12x24	41 00
10x24	41 50
8x24	43 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

	Star	D.D.
10 to 25 united inches	$4 25	$ 6 25
26 to 40 "	4 60	6 75
41 to 50 "	5 10	7 50
51 to 60 "	5 35	8 50
61 to 70 "	5 75	9 75
71 to 80 "	6 25	11 00
81 to 85 "	7 00	12 50
86 to 90 "		15 00
91 to 95 "		17 50
96 to 100 "		20 50
101 to 105 "		24 00
106 to 110 "		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for box lots:—

MONTREAL

	Star	D.D.
25	$3 40	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
90		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 u.i.	$3 50	$5 00
26/40	3 75	5 50
41/50	4 25	6 25
51/60	4 75	7 00
61/70		8 00
71/80		9 00
81/85		10 00
86/90		11 00
91/95		13 00
96/100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

STEAM FITTERS' AND PLUMBERS' SUPPLIES

Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock ...... net $1.85

No. 4½ Fuller's .... net $2.50

Square head brass cocks, 65 per cent.

Lead Pipe

Lead pipe, $7.50, less 5 per cent.; lead waste, $9.00, less 5 per cent.; caulking lead, 7 cents per lb.; traps and bends, 40 per cent.; pig lead, 5¾ cents per lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.28	¼ inch	$3.18
⅜ "	2.28	⅜ "	3.18
½ "	2.72	½ "	3.57
¾ "	3.28	¾ "	4.43
1 "	4.85	1 "	6.55
1¼ "	6.56	1¼ "	8.86
1½ "	7.84	1½ "	10.59
2 "	10.55	2 "	14.25
2½ "	16.67	2½ "	22.52
3 "	21.80	3 "	29.45

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

Soil Pipe and Fittings

Medium and extra heavy pipe and fittings, up to 6-inch, 60 and 5 per cent.

7 and 8-inch pipe, 45 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

CEMENT, STONE, STEEL, Etc.

Cement, barrel lots, in bags, delivered Toronto, bags extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ⅜-inch, $1.45.

Burnt River rubble stone delivered, $17 to $18 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¾ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

Free stone delivered, $17 to $18 per toise.

Brown coursing stone, delivered, $3.75 per yard.

Grey coursing stone, delivered, $2.50 to $2.75 per yard.

Sand, for cement or brick work, $1.15 a cubic yard, f.o.b. Toronto, C. P. R. sidings.

Sand, for cement or brick work, 90c to $1.05 a cubic yard, f.o.b. Toronto, G. T. R. sidings

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

Steel channels and beams, angles and plates, $2.65 to $3.00 per 100 pounds, delivered f.o.b. Toronto.

Hard Wall Plaster, unsanded, from $7.00 to $8.50, bags extra; sanded, $4.00 in car lots; hydrated lime, $10.00 in car lots.

Lime per cwt., delivered, not less than 1,500 lbs. 33 cents; white, 43 cents.

Plaster of Paris, Anchor and Crown Brands, $1.50.

Manilla Rope, best, per pound, 12½ cents.

PAINT AND OILS

Pure White Lead, ground in oil, $9.00 per 100 lbs.

Boiled Linseed Oil in bbls., 67c per gal of 9 lbs.

Raw Linseed Oil, in bbls., 64c per gallon.

Turpentine, in barrels, 60c per gallon.

Pure Red Lead, dry $7.00 to $8.00 per 100 lbs.

Putty, pure linseed oil, in bulk, bbls. 3½c.

Putty, pure linseed oil, in 25-lb. tins, 4c.

Argenteuil Granite Co., Limited

42 Craig Street West, MONTREAL

We are in the market to bid on your plans for granite on buildings.

Our up-to-date cutting plant, excellent quarries and good shipping facilities enable us to make close prices.

SEND US BUILDING PLANS TO-DAY

MISSISQUOI-LAUTZ CORP'N LIMITED

Producers, Importers and Workers in Marble

ANNOUNCE
the opening of their New Office and Showroom at

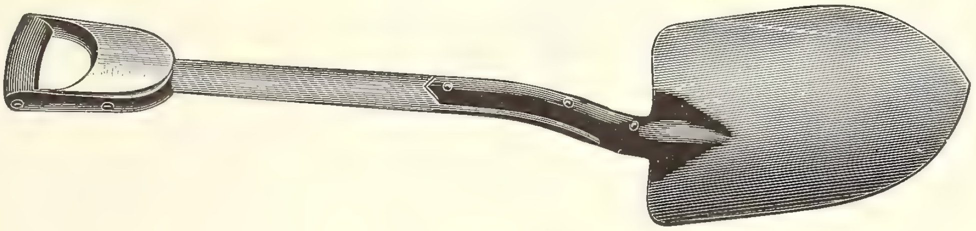
208 Read Building,
MONTREAL

Displaying a complete line of **MISSISQUOI** And all varieties of Foreign **MARBLES**

Which are open for inspection at all times to Architects, Builders and Contractors.

Any Request to Submit Tenders Will be Given Prompt Attention.

Trade Mark



LUNDY SHOVELS

Competition is met and profitable contracting achieved by the use of up-to-date equipment in every branch of the contracting business.

When it comes to digging let your men do more efficient work by supplying them with "Lundy" or "Dandy" shovels.

They enjoy a national reputation for rigid construction and durability.

We will send to any contractor, free, express prepaid a sample shovel. Send for our illustrated catalogue showing our full line of Shovels, Spades, Scoops, Draining Tools, etc.

THE LUNDY SHOVEL & TOOL CO., LTD.

General Office and Works: PETERBORO, ONTARIO

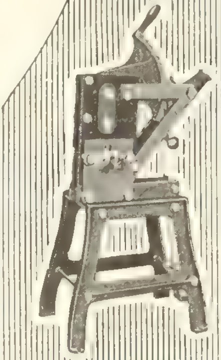
ONTARIO AGENT
N. B. Misener, Toronto

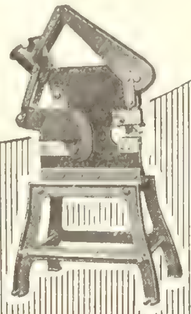
SELLING AGENTS
Delorme Bros., Montreal ; Tees & Persee, Ltd., Winnipeg
Tees & Persee of Alberta, Ltd., Calgary ; E. E. Crandall, Vancouver, B.C.

"Buffalo" Punches Shears and Drills

Among our recent designs is the Bar Cutter No. 10 for cutting concrete reinforced bars—twisted, round or any other shape. It cuts bars up to 1⅛" thick and, due to its steel frame, its **weight is only half** that of a cast iron machine of the same capacity. Ask for catalog of Steel Punches, Shears and Drills No. 145.

Canadian Buffalo Forge Co.
MONTREAL Limited
St. John Winnipeg
Toronto Vancouver



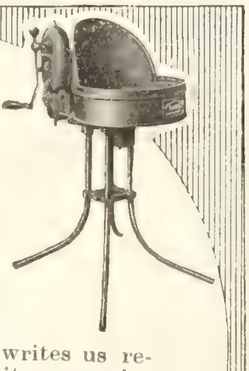


"Buffalo" Forges

"Built to Last"

is the slogan of our **1912 Rivet Forge.** The repair cost by this design is guaranteed to be actually **cut in two,** compared with any other forge now in the market. A bridge company using a large number of forges writes us regarding it: "The operator claims it runs easier and heats more rivets in less time than any forge he has ever used." Let us send you one on free trial. Fifty other styles, for light and heavy work.

Canadian Buffalo Forge Co.
Limited
Montreal
St. John Winnipeg
Toronto Vancouve



Structural

Water-proofing

"DEHYDRATINE"

For Water-proofing under the membranous method.

"HYDRATITE"

For Water-proofing Concrete.

"FERRO FAX"

For Surface Hardening Concrete Floors.

"SYMENTREX"

A Cement Coating—Makes Surfaces Water Shedding.
MADE IN COLORS

"These Trade Names protect you against the possible selection of inferior materials. Whether you prefer a water-proof paint or a compound, we can give you satisfactory assurance as to the reliability of these products."

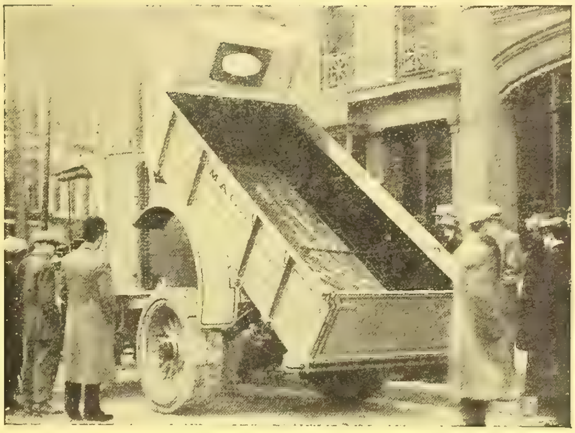
"FOR 15 YEARS STANDARD OF THEIR KIND."

Pinchin-Johnson & Co.
(Canada) Limited
Minerva House, - Toronto
Write for Particulars and Architect's Hand Book (1913 edition)

AGENCIES IN ALL CITIES

MACK

You Can Dump a Load in 35 Seconds Without Leaving Your Seat



Among the problems confronting the contractor, the disposal of waste and the haulage of building material is one of the most important. The motor truck solves this problem for you quickly and economically.

The power dump truck, on which the body of the truck is raised by a shaft geared to the main engine drive, is one of the greatest labor and time saving features of motor truck work. It is operated by the driver without leaving his seat and may be stopped and held at any angle.

In dumping stone, sand and other road building material the body can be held at the desired elevation and the truck driven slowly ahead, spreading the load as it moves along.

When you buy a Mack Truck you do not buy Theory but History. Mack Trucks have proven their reliability by 12 years of real service.

Let us give you the facts about the Mack and how it makes dollars for contractors. Write to-day.

The Canadian Fairbanks-Morse Co., Limited

St. John, N.B. Quebec Montreal Ottawa Toronto Winnipeg Saskatoon Calgary Vancouver

11

Across Canada with the

Imperial Wire & Cable Company, Limited

Toronto MONTREAL Winnipeg

Third of a series of advertisements showing buildings of national importance which have been wired with Imperial Wire and Cable Co's. Limited, wires.

This picture shows

THE McARTHUR BUILDING, WINNIPEG

This building was wired with "30% PARA" Rubber Insulated Wire.

Architect; J. H. G. Russell, Winnipeg
Engineer; Charles L. Pillsbury, Minneapolis, Minn.
Electrical Contractors; Mitchell-Gray, Electric Co., Winnipeg.

Address enquiries to nearest office

MONTREAL TORONTO WINNIPEG

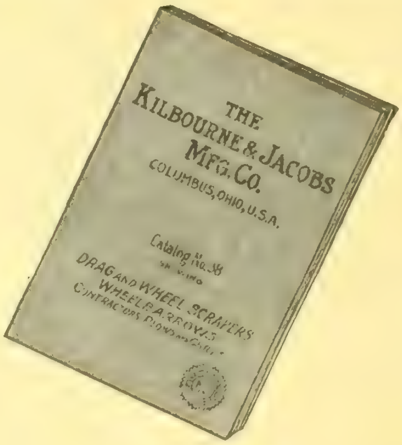
Enquiries from Alberta and British Columbia may be addressed to Northern Electric & Manufacturing Co., Ltd. Calgary and Vancouver.

"ADANAC" "IMPERIAL HIGRADE" and "30% PARA"

A Catalogue—

Every Builder and Contractor should have.

**Have you received
your copy of
K. & J. Catalogue
No. 38?**

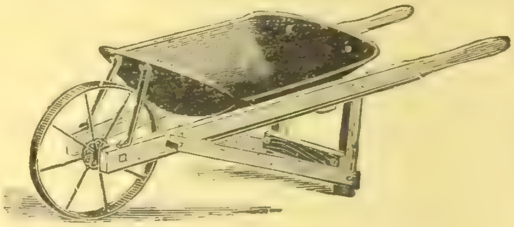


**Have you received
your copy of
K. & J. Catalogue
No. 38?**

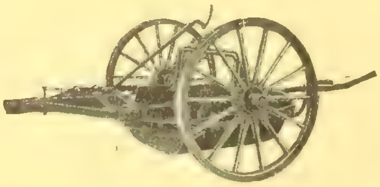
This New No. 38 Kilbourne & Jacobs' Catalogue illustrates and describes fully every style of barrow, wheel or drag scraper and plows. You may require equipment of this description—perhaps not at the moment but later on. This book will surely be of assistance to you as you can select the proper style of barrow, etc., for your requirements. Let us send you a copy—free for the asking.

"Kilbourne & Jacobs" Wheel Barrows

All styles in
stock



Wheel and Drag Scrapers



F. H. Hopkins & Co.

MONTREAL

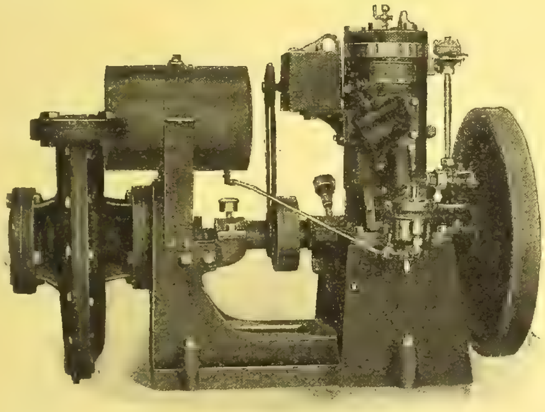
BRANCH OFFICES: General Supply Company of Canada, Ltd., Winnipeg Agents
Ritchie Contracting & Supply Company, Ltd., Vancouver Agents

Vol. 27 Toronto, September 17, 1913 No. 38

ESTABLISHED 1886

Contract Record and Engineering Review

We manufacture all kinds of Steam and Power Pumps for all kinds of services, using only the best material and workmanship.



THE SMART-TURNER MACHINE CO. LTD.
HAMILTON, CANADA

"MADE IN CANADA"

Bent Glass

Made in all Kinds of Glass on Short Notice

Large Bent Plate Glass for Shop Fronts a Specialty

The Toronto Plate Glass Importing Company, Limited
(HILL & RUTHERFORD, Managing Directors)
Head Office and Works : 91 to 133 Don Roadway
TORONTO

INGERSOLL-RAND

SHEET PILE DRIVERS

—Prove the Value of Experience.

—Utilize all the Energy.

—Have Standard Mechanism.

—Are Handled with Facility.

Send For K-139.

Canadian Ingersoll-Rand Co., Limited
MONTREAL, CAN.

Continuous and Machine Banded Wood Stave

WATER PIPE

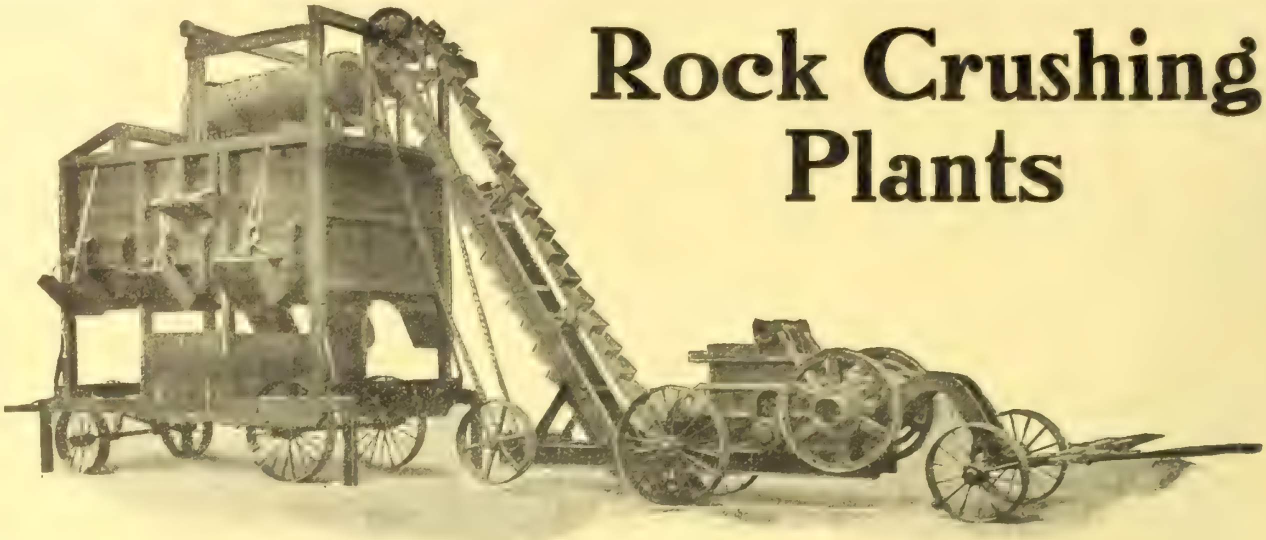
RESERVOIR TANKS

for city and town Water Systems, Fire Protection, Power Plants, Hydraulic Mining, Irrigation, etc. One-half the cost of Iron Pipe—and better.

Pacific Coast Pipe Co., Limited
P. O. Box 563 Vancouver, B. C.
Office and Factory, Granville St., near High Bridge
WRITE FOR CATALOGUE
Full Particulars and Estimates Furnished

Alphabetical Index of Advertisers, Page 16

Classified Directory to Advertisements, Page 6



Rock Crushing Plants

Complete, Self-contained, Portable, Crushing, Grading and Loading Plant

The adaptability of the above plant, the ease with which it can "follow the job" makes it an ideal outfit for the the Contractor. It is only one of our many combination machines for crusher work.

Full details of the various parts will be gladly furnished by any of our offices.

THE JENCKES MACHINE COMPANY, LIMITED

Sherbrooke St. Catharines Montreal Cobalt South Porcupine Vancouver Nelson

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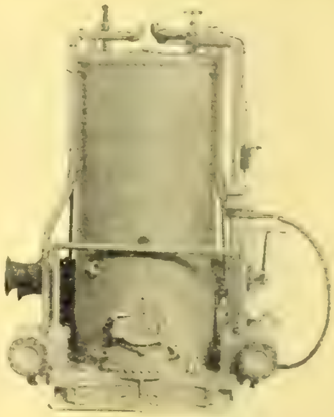
Are You Paying for Power You Don't Get?



Are you sure that your engine is developing all the horse power its cylinders are capable of, or are the cylinders clogged and hampered by the exhaust?

When the exhausts from both cylinders feed into one main exhaust pipe the steam does not escape from the cylinders rapidly enough but backs up and blankets their action. When this is the case the exhaust channel is further choked with elbows, tees and connections that break the smooth flow of the steam and affect the power appreciably. The amount of horse power that is lost in this way is staggering. We have the figures down in black and white. They are the results of an exhaustive series of comparative tests with "AMERICAN" Engines.

All "AMERICAN" Engines are now being equipped with separate exhausts from each cylinder and they are without a joint or a connection till they reach the top of the boiler. As a result their former superiority is greatly increased.

Are you satisfied to keep on paying your good money for power that dies "a'borning," or are you going to give us your order for an "AMERICAN"?

Made by

AMERICAN HOIST & DERRICK COMPANY

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SOME men ask for so many bags of "cement"—

Others, more careful, say they want "Portland Cement"—

But the man who does the best work insists upon getting "Canada" Portland Cement—

And he looks to see that every bag bears this label

CANADA CEMENT COMPANY LIMITED
PORTLAND
CANADA
CEMENT
MONTREAL

TO specify Canada Portland Cement is to introduce an additional safety factor into your calculations. Architects, contractors and engineers know the value of "making assurance doubly sure."

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One Principle Backs All Work

"THE JOB MUST SHOW A PROFIT"

Whether it is Sewer Work or Dredging, Excavating or Rehandling, you cannot buy a more efficient and durable bucket than a

HAYWARD

Orange Peel or Clam Shell

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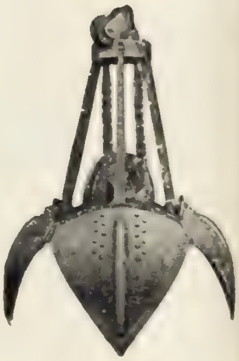
The one that will save money in every direction, rendering at the same time a greater amount of work than any other automatic bucket on the market.



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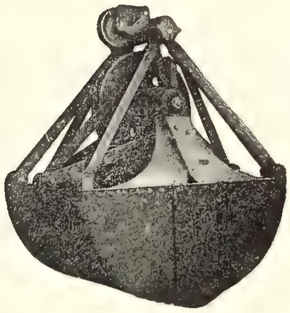
MUSSENS

Don't Put Up Your Money

Until You Investigate

Get a bucket guaranteed to do
the work for which it is sold.



Hayward Buckets

stand the acid test of investigation and comparison, if maximum results and absolute dependability in all classes of work are desired.

Hayward Orange Peel Buckets are unequalled for digging and rehandling hard substances such as boulders, hard-pan, cemented gravel, etc.

Hayward Clam Shell Buckets, also automatic in action, are unequalled for handling softer materials.

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(Continued on page 12)

The Canadian Bank of Commerce, College and Dovercourt, Toronto.

Don Valley Uniformity

The uniformity of size and shade and the unvarying good quality of Don Valley Clay Products has made them the popular material for every class of building.

For bank buildings the architectural possibilities of Don Valley Bricks are almost without number. Some pleasing and permanent effects may be obtained by arranging the bricks in patterns or panels.

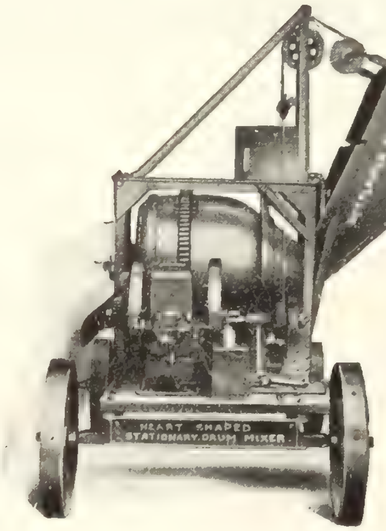
Don Valley Clay Products are specified for Canada's finest buildings.

Use the Best
Don Valley

Don Valley
Brick Works

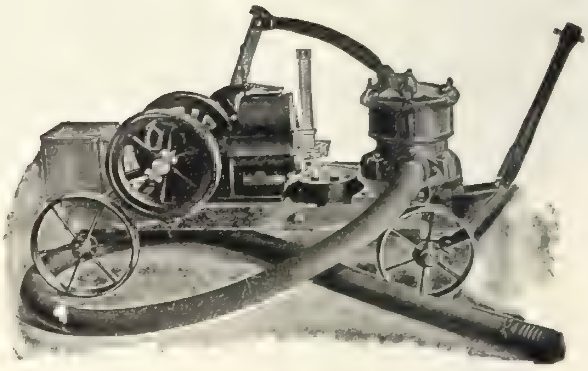
Toronto
Ontario

Wettlaufer



The heart shaped drum of the Wettlaufer mixers has revolutionized the construction of mixers. This special drum turns the material in every possible manner thus insuring a perfect mixture. Wettlaufer mixers are made in many types and sizes.

Daily demonstrations at all our branches.



Here illustrated is the handy Wettlaufer contractor's pump, fitted with a gasoline engine. The pump is mounted on wheels or may be supplied on skids. It is light, easily portable and of high capacity.

May we send particulars.

Wettlaufer Bros.

178 Spadina Ave., Toronto, Ont.

Factories: Mitchell, Ont., Buffalo, N. Y., Detroit, Mich.

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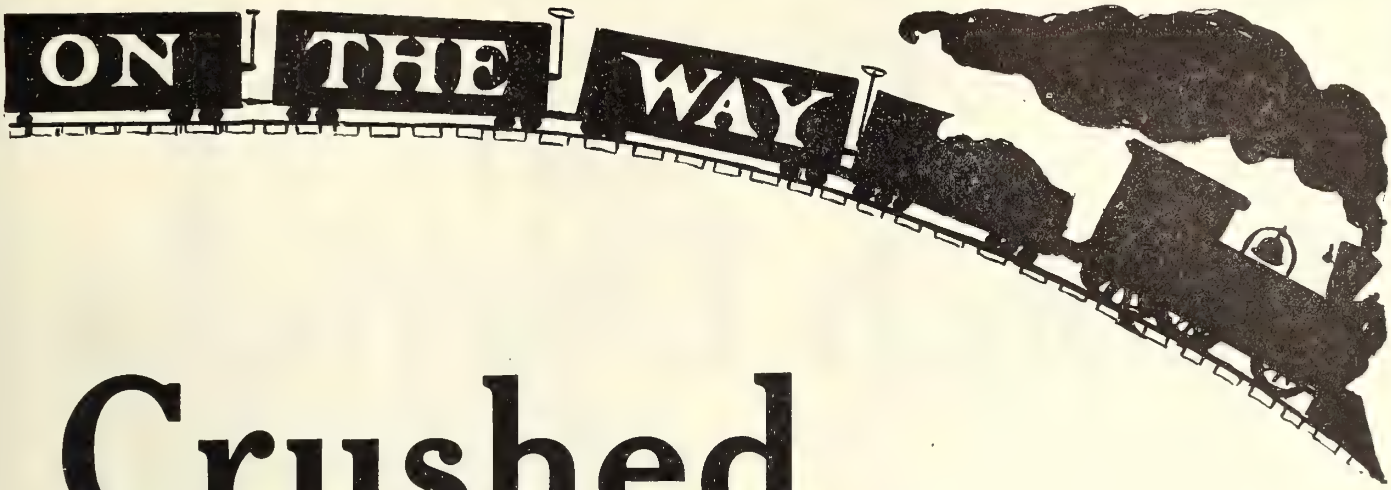


Crushed Stone

If you want crushed stone in a big hurry come to us and you will get it.

Our bins are always loaded to the top with stone of all grades and shipments can be made the day your order is received.

Quarries located at Dundas and Vinemount.

Portland Cement

Our several cement mills are located at various points that enable us to make prompt shipments with short hauls.

Send us your next order.

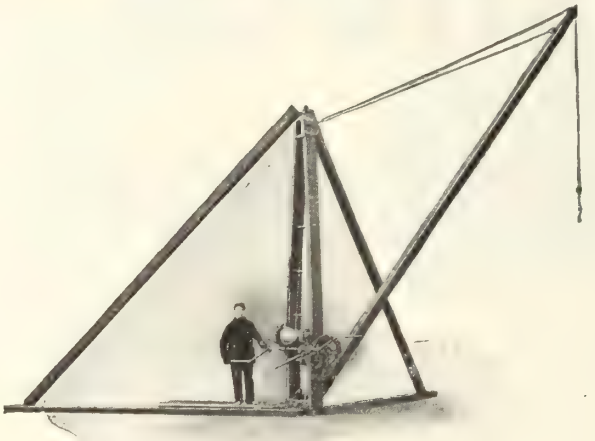
Alfred Rogers

Limited

28 King St. West, Toronto

Beath Scotch Derricks

Hand or Power



THE construction of Beath Scotch Derricks embodies several points of merit not found in other makes.

All stress parts are **steel** not cast iron. Bottom Pintle Bearing is of ball and socket type and works in a bath of oil, thus ensuring an easy movement at this joint.

Beath Derricks are provided with self-oiling bearings, ensuring easy operation and reducing wear to a minimum.

We also make Jinniwink Derricks, Stiff Leg Derricks, Guy Derricks, and Steel Derricks for heavy service. Hand or Power operated.

Send us your enquiries for Derricks

W. D. Beath & Son, Limited

ENGINEERS AND MANUFACTURERS

20-30 Cooper Ave., Toronto

The A. M. Ellicott Co., 301 St. James St., Montreal, Que., sole selling agents for Province of Que.

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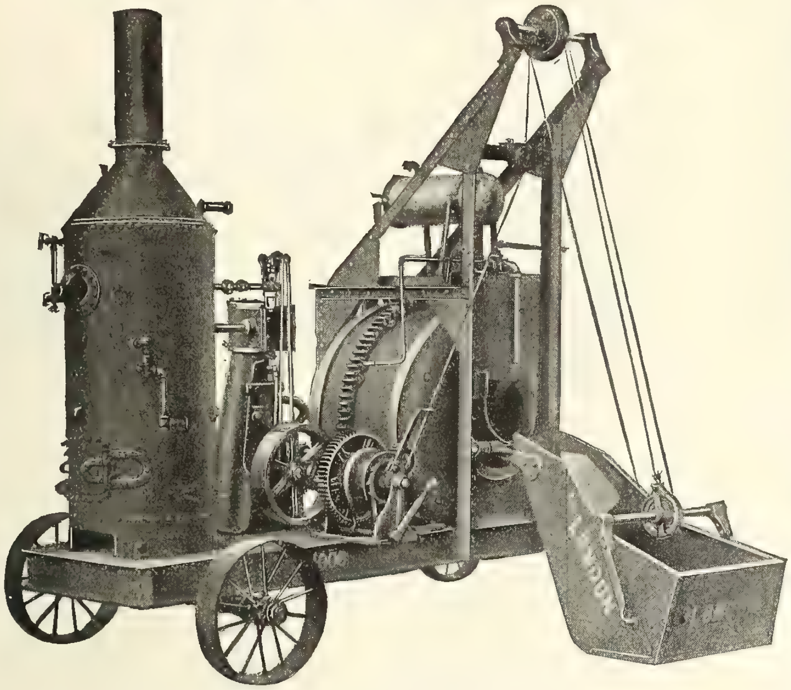

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Several Kinds, and built in sizes to suit all classes of work

The many improved features of the London Mixers have placed them in a class by themselves.

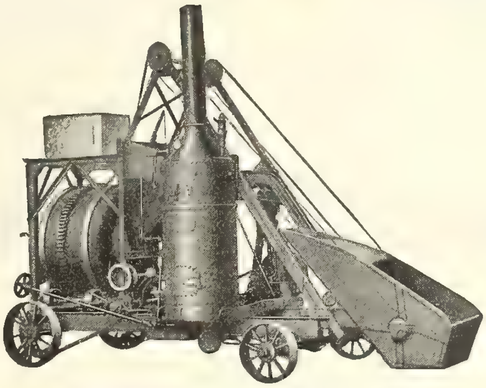
We can save the contractors money—

On First Cost
On Cost of Maintenance
On Cost of Operation

SEND FOR OUR CATALOGUE

We manufacture a full line of Concrete Machinery and Cement Working Tools.

Also a full line of Hoisting Engines and Contractors' Equipment.

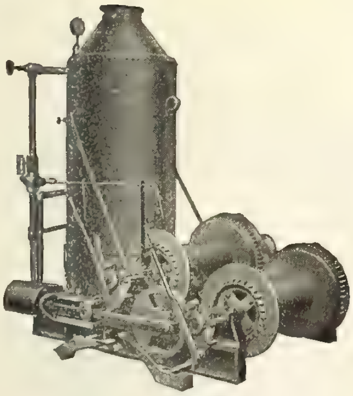


Rear Discharge Paving Machine with Forward Loader

Every machine made in our own factory.

Our machines are not made down to a price, but **made up to a standard.**

By manufacturing on a **large scale** we have been able to offer **high grade machines** at **remarkably low prices**



Standard Hoisting Engine

We are the Largest Manufacturers of Concrete Machinery in Canada

No. 2 Automatic Batch Mixer

London Concrete Machinery Co., Limited

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Noble, Clarence W.
Paterson Mfg. Co.

(Continued on page 14)

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Glass Case—Top Connections

Simplicity of construction.
Perfect accuracy.
Cyclometer or clock dials.
Top or bottom connections.
Prompt deliveries.
Every meter carefully inspected before shipment.
Absolutely guaranteed.

Send us your probable meter requirements and let us make you a proposition.

Large stock and fully equipped repair and erection Shops at Toronto and Winnipeg.

Steel Case—Top or Bottom Connections

The Ferranti Electrical Co., of Canada, Limited

TORONTO
90 Sherbourne St.

WINNIPEG
56 Albert St.

County Academy, Sydney, N. S. Built of Sydney Pressed Brick

Our plant is the only one of its kind in Canada making pressed brick from blast furnace slag. Brick made from this material is hard as flint—hardens with age and adheres with great strength to mortar.

Prices and Particulars on Request

Sydney Pressed Brick Co.

Limited

Sydney, Nova Scotia

Busy Contractors Use New Model Aurora Dump Wagons

because they want wagons that will haul the most material in the least time and that are on the job every working hour.

A novel feature has been added to this wagon which places it beyond comparison with any other on the market, namely, **a steel channel filled with wood for the main side board,** giving unusual strength. This is the portion of the wagon that stands the heaviest strain, With this reinforced side board, breakage is practically impossible. It is short coupled and built low. Light in weight. **Write today.**

Western Wheeled Scraper Co.

Aurora, Illinois

Earth and Stone Handling Machinery

Dominion Supply & Equipment Co., Winnipeg-Calgary-Edmonton—Agents for Manitoba, Saskatchewan & Alberta

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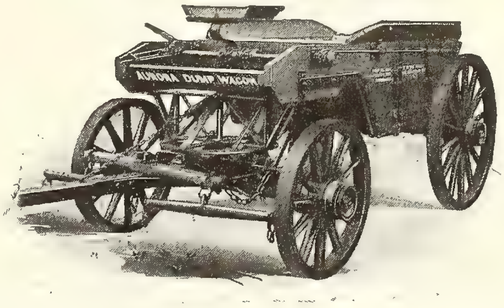

Hagersville Crushed Stone

The Toughest Stone for Macadam in Ontario

Record of Logan Avenue, Toronto, Macadamized from Queen St. to Gerrard St., in 1902

Length 2,454 Lin. Ft. Width 24 Lin. Ft. 6,550 Sq. Yds.

COST FOR REPAIRS

1903	$ 0.00	1908	$ 93.26
1904	3.30	1909	200.46
1905	9.35	1910	14.07
1906	37.33	1911	2.29
1907	16.11		

Total $376.17 or 5⅔c. per sq. yd. for repairs for nine years, a little over 6-10 of 1c. per sq. yd. per year.

Why Not Use Hagersville Stone and Get These Results?

Hagersville Contracting Co.

Hagersville, Ont. **Limited**

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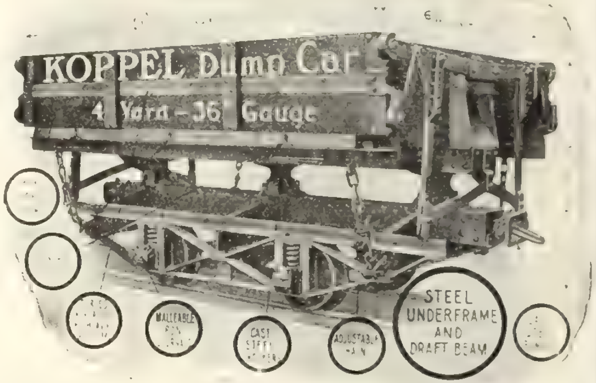
What Big Contractors

Say About This Koppel Car



Just to show you what contractors think of Koppel Cars, we quote below a letter from McMenamin & Sims, Contractors, of Philadelphia, Pa., referring to the type of car shown here:—

"The car was used here for hauling clay, gravel, and loose earth only. We find it is an excellent car, very much better than the average two way dump car. The car dumps very easily when loaded and returns to the upright position with ease. When dumped the material runs out freely and the bed in dumped position clears the dumped material very nicely.

In dumping any car we find that the initial lift requires the most men. This is greatly alleviated by the manner in which you have your bed supported on the truck. Our shovel engineers say it is a very easy car to load, as the bed is low, broad and long, thus obviating the necessity of getting the dipper so exactly above the center of the car."

This car is built for 36-inch gauge and will carry a heaping load of over 6 yards. It is designed for hand or air dump, and on account of the long side throw the material is dumped clear of the rails. Large quantities of these cars are kept in stock at Koppel, Pa.

Let us send you catalogue and specifications.

Orenstein-Arthur Koppel Co.

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Preserves Roads
Prevents Dust~

Overcomes Washing on a Heavy Grade

The above cut shows Russell Hill Road in Toronto, a water-bound macadam road with a heavy grade. Formerly great damage was done to the surface of this roadway by washing, and incessant repairs were required to keep it in satisfactory condition.

In June, 1912, a coat of "Tarvia B," at the rate of one-third gallon per yard, was applied. The Tarvia penetrated into the road surface and hardened, thus reinforcing the natural binder, cementing the surface together and making the surface shed water like the proverbial duck's back. The torrents which formerly had destroyed the surface now ran off harmlessly, and the road showed no further signs of washing. In addition, the surface remained practically dustless and gave superior resistance to automobile traffic.

Water torn roads are as unnecessary in these days as dusty roads. The up-to-date engineer knows how to prevent water damage and dust by the use of a bituminous binder. The best and most economical binder is Tarvia, a coal tar product especially prepared for road work.

There are three kinds of Tarvia:—"Tarvia X," very dense, for the large voids of new construction; "Tarvia A," for thorough resurfacing work; "Tarvia B," which was used in the above contract, for dust prevention.

In all cases the function of Tarvia is the same—to seal the surface against water, to give it an element of plasticity enabling it to resist automobile traffic, and to bind the stone together to prevent internal movement and attrition by traffic. Booklets on request. Address our nearest office.

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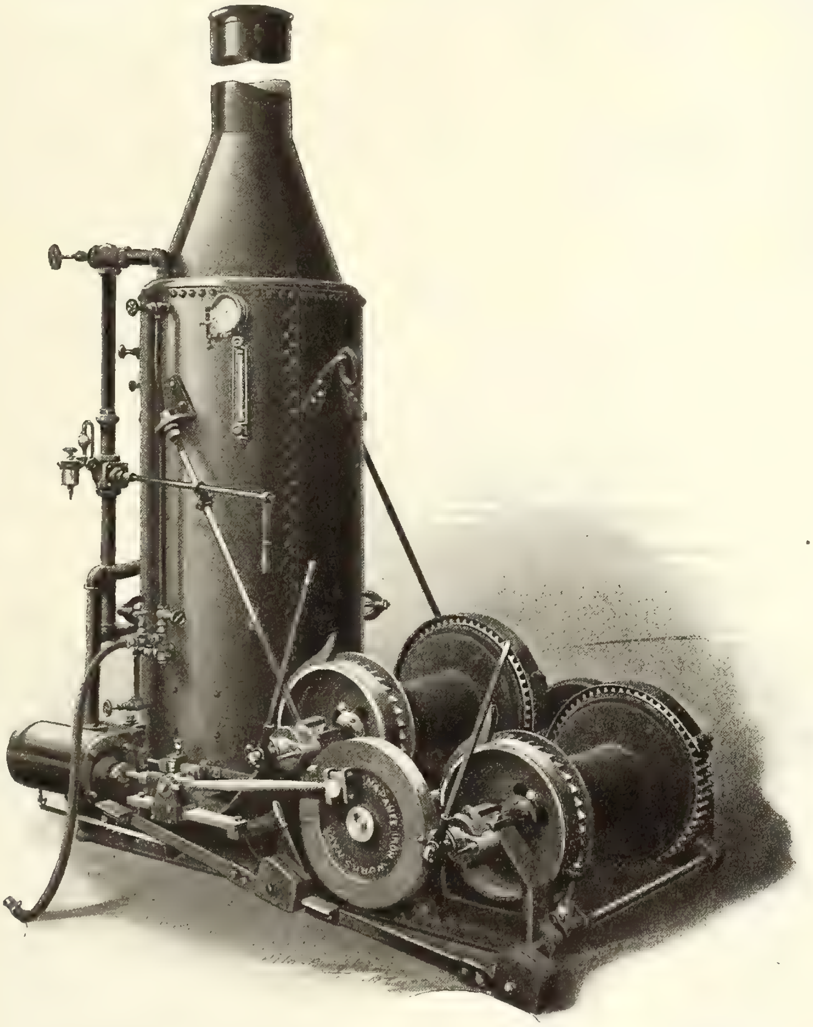

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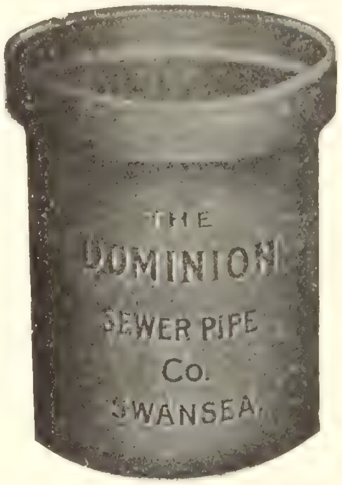

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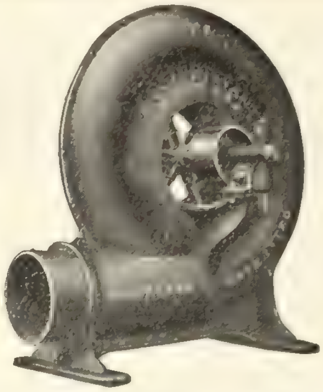

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The best materials only are used in their construction. The wheels are carefully balanced, the shafts are made of the best quality steel, turned and ground to exact size, the bearings are large and lined with the highest grade anti-friction metal.

Sturtevant Stock Fans are built in all types and sizes, and are carried in stock ready for immediate shipment at our works at Hyde Park, Mass., and at our Philadelphia, Chicago and San Francisco warehouses.

Bulletin No. 134Z describes these fans in detail.

B. F. Sturtevant Co. of Canada, Limited, Galt, Ont.
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"Mimico" Pipe have been their own recommend. Once tried, they are always bought.

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The fact that discounts are the same now as six months ago proves—well, it has been some temptation.

Order a car to-day. No long waits for "Mimico" pipe.

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Vitrified Hollow Building Blocks

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TWO SEWER PIPE FACTORIES: **St. Johns, P. Q., and New Glasgow, N. S.**

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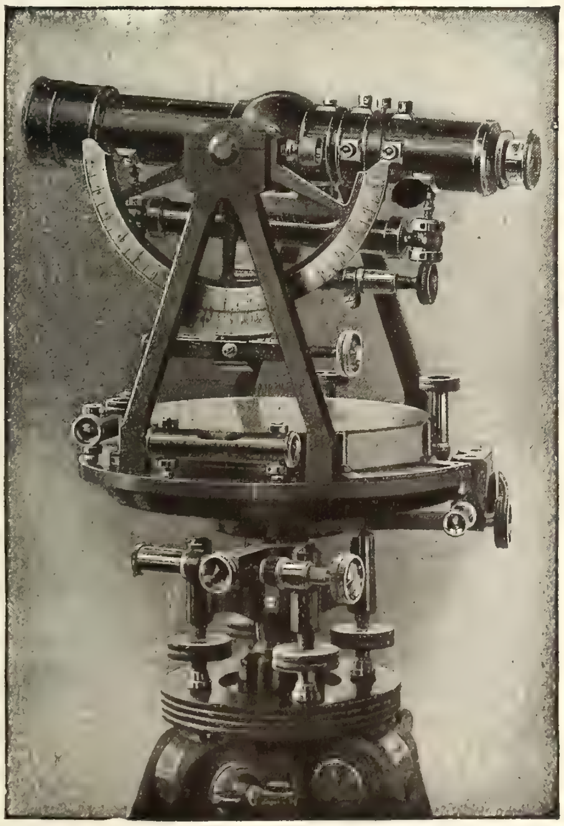

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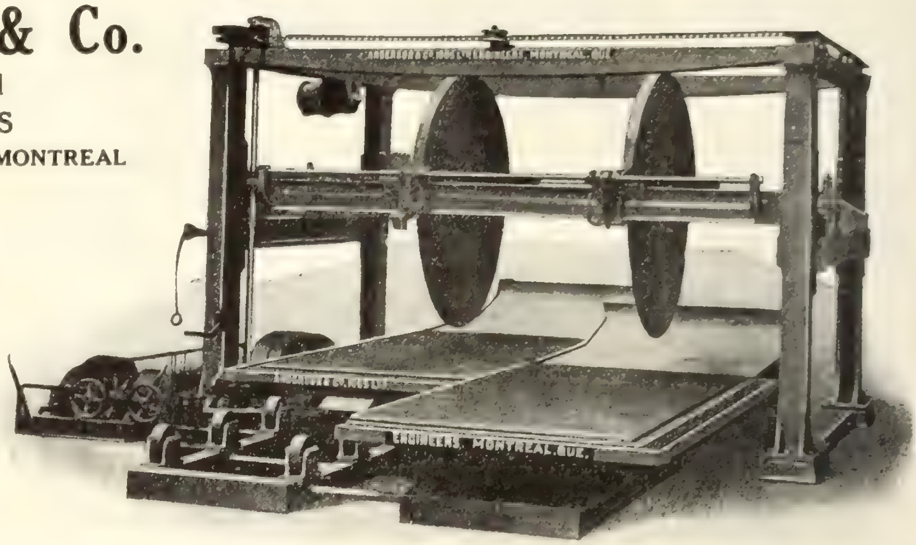

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This morning I saw ten houses under construction, each by a different builder. Each house had cement stucco forming part or all of the outside wall. In every case the stucco was applied on Herringbone Metal Lath. Ten years ago it would have all been on wood lath.

Every one now knows that the only way to prevent buckling of lath in walls exposed to sun and rain is to use Herringbone Metal Lath."

Clarence W. Noble, ***General Sales Agent***

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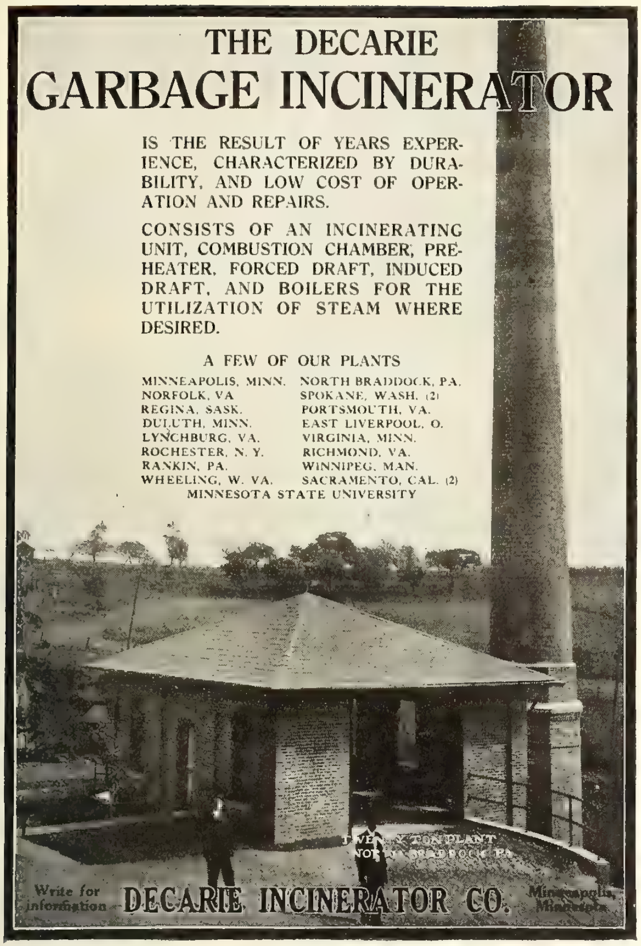

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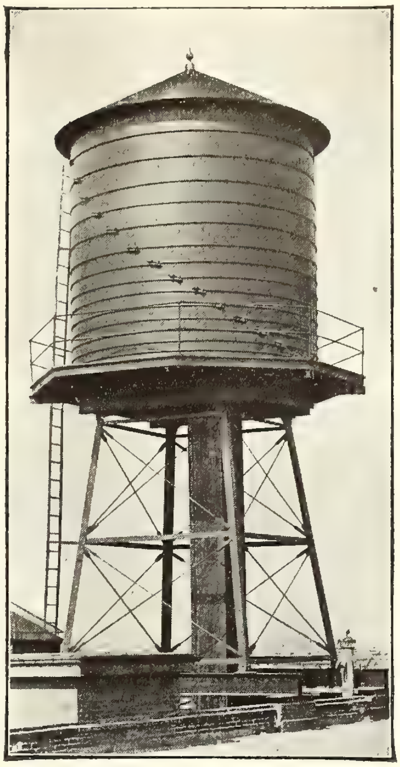

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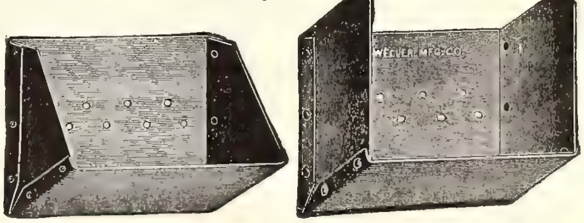

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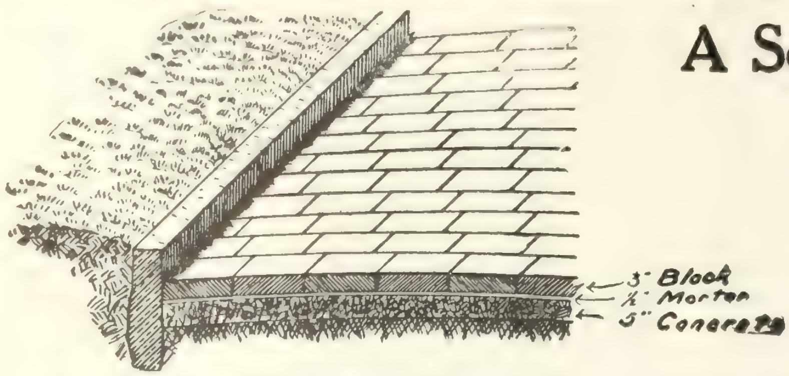

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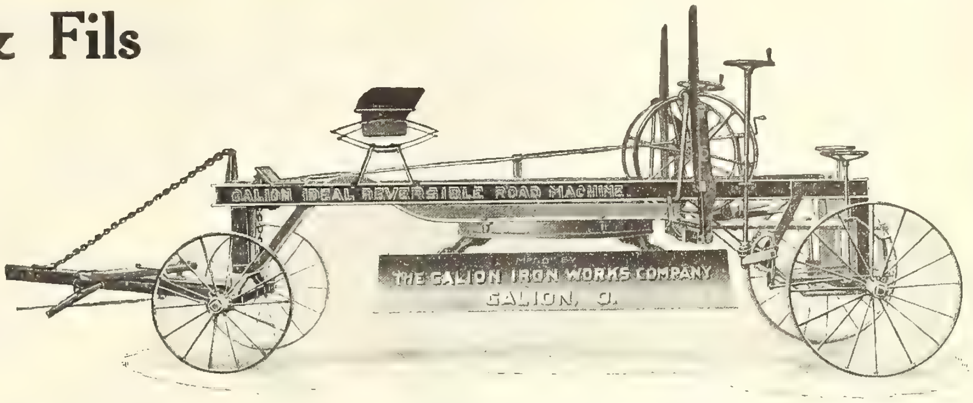
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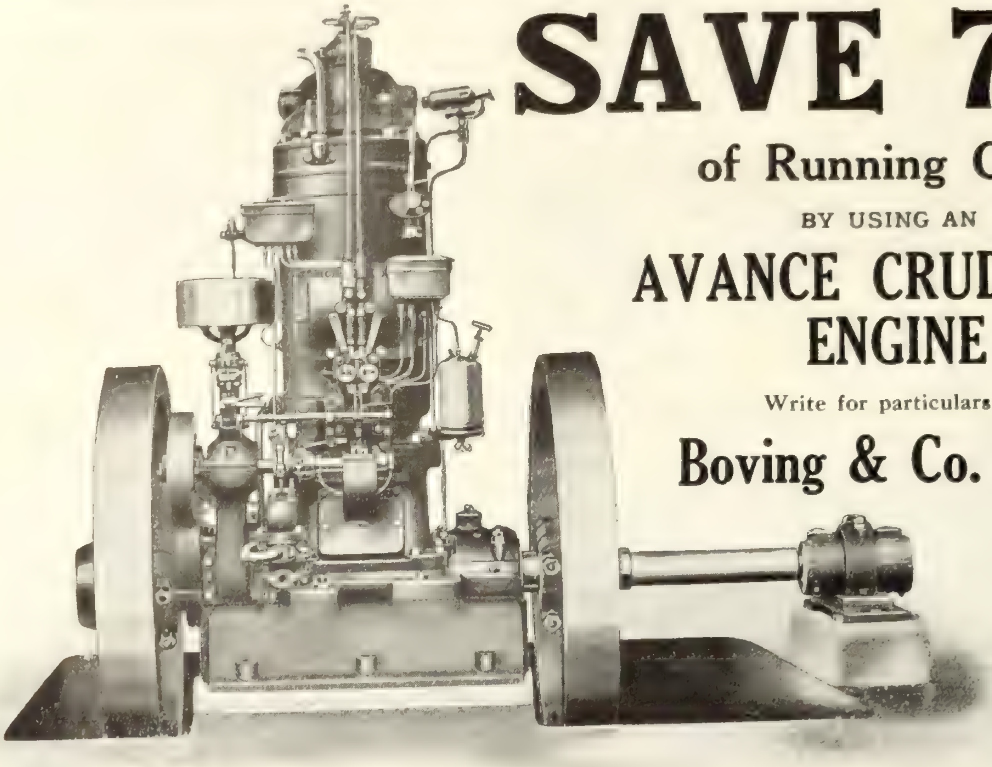

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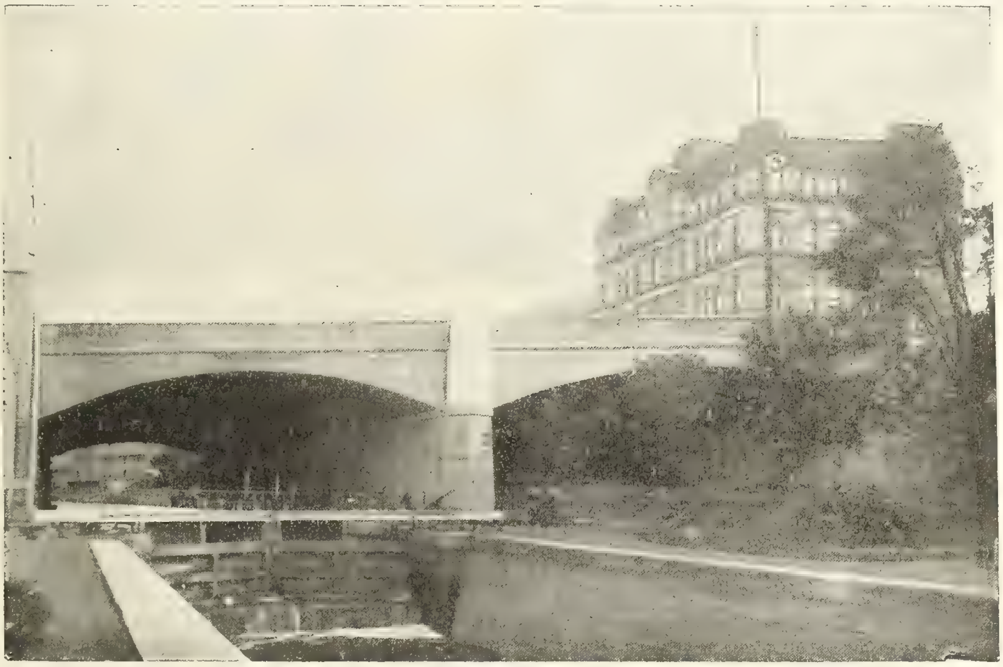

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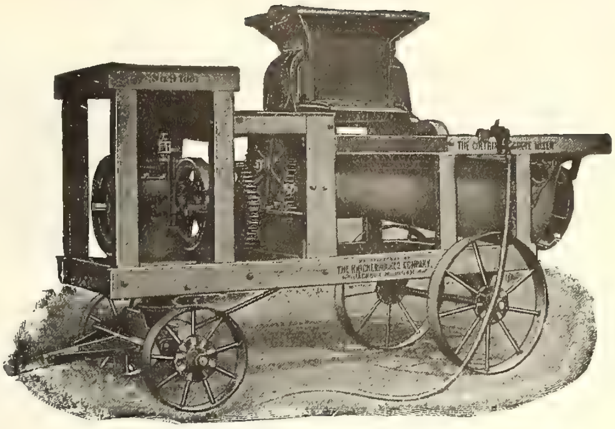

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No. 9

The housing is removed to show the heavy gear drive. Note also the solid construction throughout. "BUILT TO LAST."

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The mixer that eliminates the wheelbarrow.
The mixer that will pour a continuous stream of perfectly mixed concrete—mixed in *absolutely accurate batches.*

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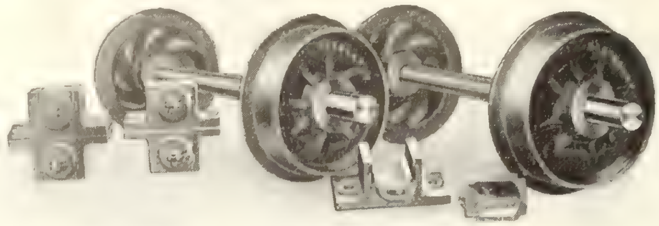

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The contractor with men and teams cannot compete successfully with the man who owns a THEW SHOVEL.

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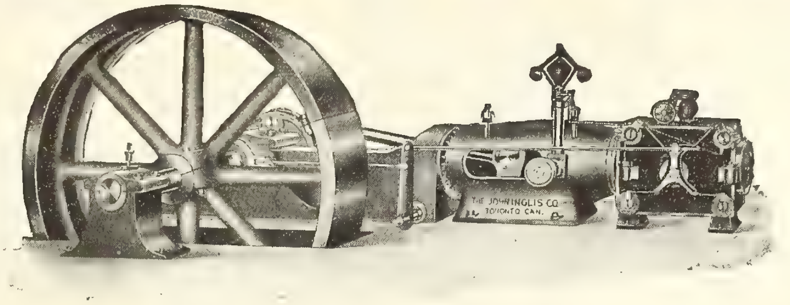
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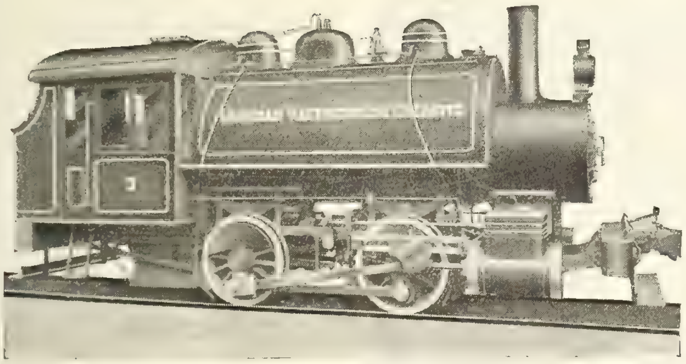

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and can be supplied with wood or gas pipe handles.

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A valve leaking—a belt stretching—a hose bursting. These may not seem very serious in themselves, but from the standpoint of "lost time" and "disorganization" they *are* serious.

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Goodyear *Suction Hose*—smooth or rough bore. Steel wire wound internally to prevent collapse. Built for every conceivable purpose; oil, gasoline, acids, etc.—made in all sizes up to 16 inches.

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It is the most modern plant in the city.

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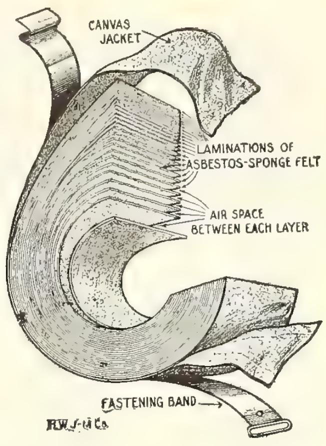
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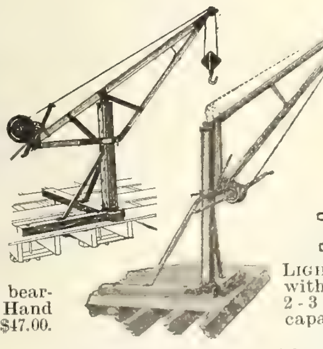

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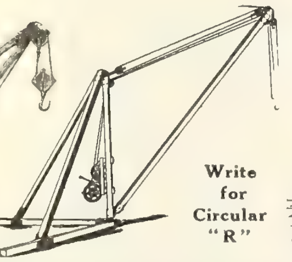

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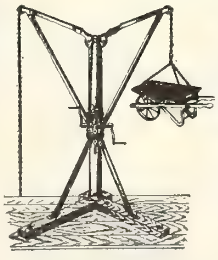

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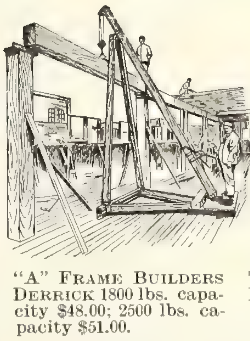

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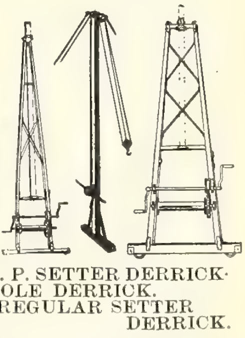

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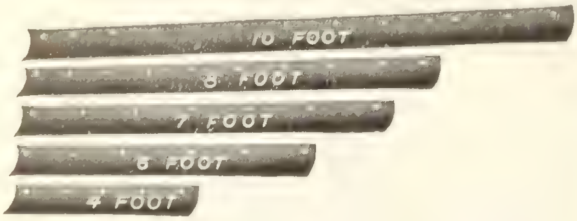

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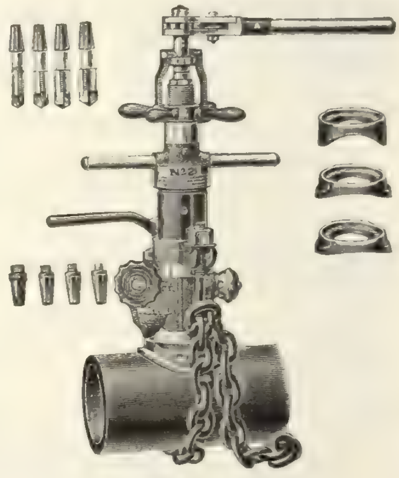

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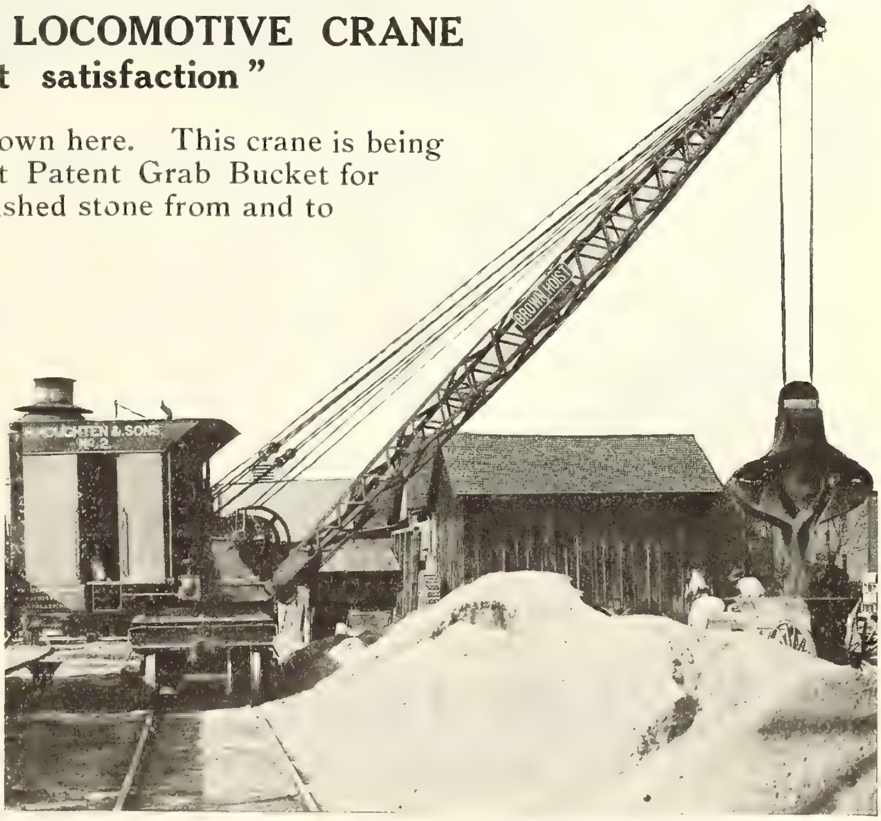

Note that the bucket is opened only so far and no sand is spilling over the sides of the wagon. This fine operation is obtained with all Brownhoist Locomotive Cranes and bucket.

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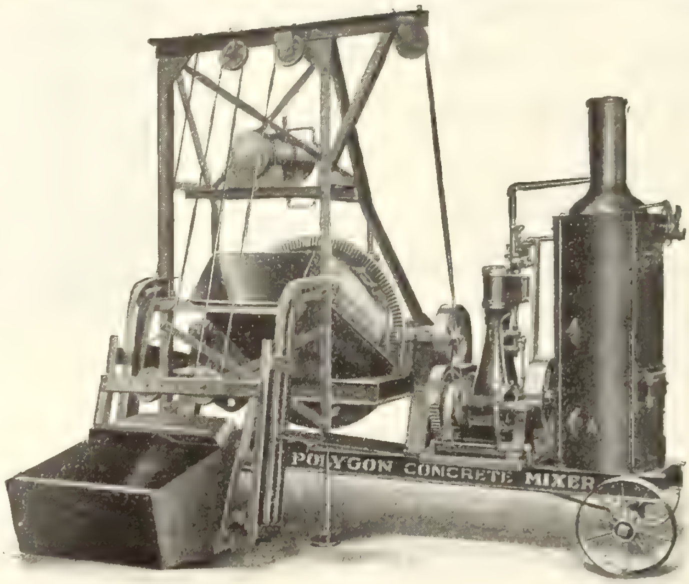

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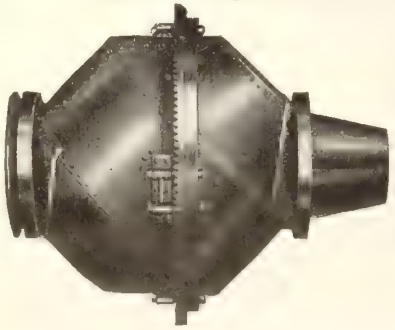

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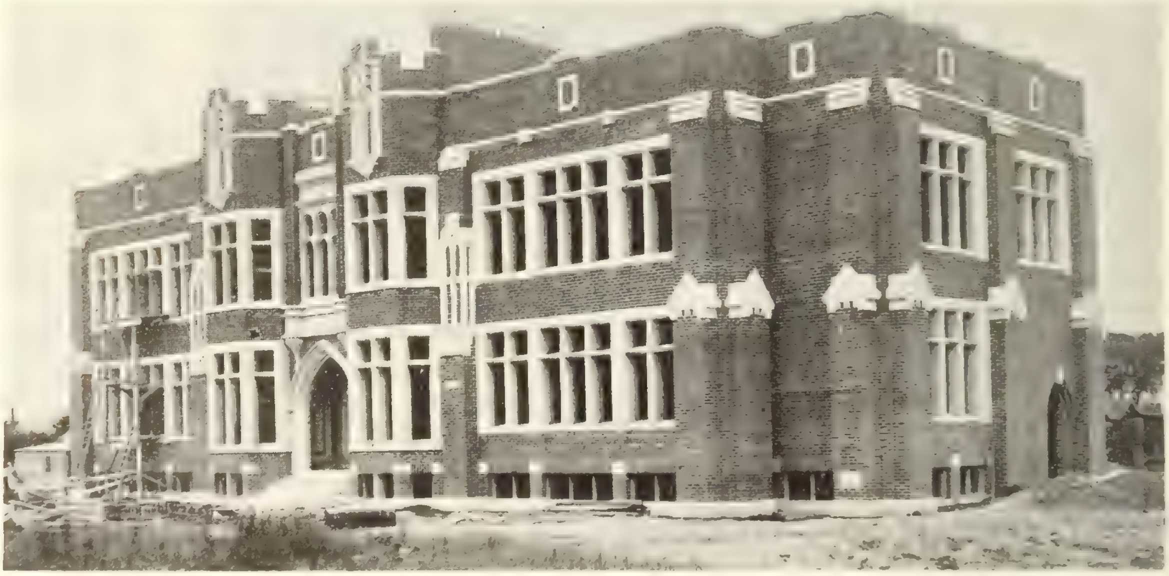

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ESTABLISHED 1886

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Alphabetical Index of Advertisers Page 16

Vol. 27 September 17, 1913 No. 38

Problems of Finance and Distribution

IN spite of the fact that a number of alarmist statements have been going the rounds during the last week or two, general trade conditions throughout the country are very satisfactory. Particularly in the west has a change in the direction of improvement taken place. Excellent crop prospects have inspired a strong feeling of confidence and money is becoming more plentiful. It may be asserted safely that with the garnering of a crop estimated at a value of nearly three hundred millions the financial stringency—if such it may be called—will soon have passed into history.

Reports from a number of western cities showed that August was a better building month than either June or July. Building records to date show that Calgary is having one of the most active years in its history in this respect. The permits issued up to the end of July were close on six million dollars and thousands of dollars' worth of new permits are still being issued daily. At the end of the present month the permits are expected to total seven millions.

Toronto particularly has been complaining of decreased activity in the building trades, as evidenced by the number of men idle. Here, however, we believe the conditions to be peculiar to a city which is becoming the eastern dumping ground for thousands of immigrants. Not only that, but lately there has been a large influx of men from outside points who have been attracted to the city by reports of higher wages obtained in several trades earlier in the year. We are confident that with the amount of construction work going on throughout Canada there is ample room for all. It is simply a problem of distribution—one that will solve itself very quickly. Last week we referred editorially to the creditable showing of the city of Montreal, which, with an expenditure of nearly fourteen millions for the eight months, recorded an increase of nearly 25 per cent. over the corresponding period of 1912. Montreal would appear to be the solution of Toronto's surplus labor.

Railroad construction and road-building are progressing actively in all sections of the country. The work that is being carried out is of a more enduring character than ever before and greater attention is being paid to securing permanent roads rather than temporary surfaces. There have been numerous reports of extensions to railway buildings and the erection of car shops and repair plants. In the building field the activity has been greatest in residences in the east and in factories and other commercial buildings in the west.

In the supply market the prices appear to be well balanced between the consumer and the manufacturer, with present conditions arguing in favor of higher rather than lower levels.

Is Canada Big Enough for a Municipal Engineering Society?

IN a recent issue of this journal the suggestion of founding a municipal engineering society was brought forward by Mr. R. O. Wynne-Roberts, of Regina, who pointed out that this branch of the profession was practically unique in having no representative body; further, that the extent of the territory over which engineers were distributed in this country, so far as providing an argument against the formation of a society, was one of the most powerful reasons in favor of it, in that the work of a representative body would eradicate the present tendency to insularity brought about by the isolation of engineers in the cities and provinces of the Dominion.

Since the publication of Mr. Wynne-Roberts' letter, the proposal has come in for a good deal of attention and has called forth editorial comment from several of our contemporaries. It is gratifying to note that these have been favorable—with the single exception, perhaps, of a suggestion that has been made to organize the proposed society as a section of the Canadian Society of Civil Engineers. We cannot agree that there are already too many technical societies in Canada. Competition is essential to success. The city of London has a population of seven or eight millions but there is always a vacancy for the man who can achieve.

Viewed from the outside, the Canadian Society of Civil Engineers has not taken an active part in things of vital interest to municipal engineers. Admitted the Society has a long and honorable record and that it has done much to place the engineering profession in Canada on a higher plane. But we cannot overlook the fact that a few short months ago many of its prominent members were not afraid to sign their names to letters published in this journal which at times constituted severe criticism of the Society's activities—or rather inactivities. The Canadian Society of Civil Engineers, we repeat, has done excellent work, but it is just possible that, owing partly to the nature of its constitution and partly to the fact that a certain interest has been the controlling factor for a number of years, it is running in a groove.

Now from what we can gather, the idea of Mr. Wynne-Roberts and his supporters is to get the municipal engineering profession out of the groove and to organize and conduct its affairs upon somewhat different lines from those of the C. S. C. E. We are at a loss to understand why the membership of the prospective organization should be so difficult to build up when, as Mr. Wynne-Roberts stated in the communication to which we have referred, according to the Dominion census of 1911 there were 107 cities and towns in Canada having a population of four thousand and more, and that at the present rate of increase that number will be increased to two hundred by 1921. Mr. Wynne-Roberts contends that there are from three to five hundred engineers in Canada engaged on municipal work who would support a distinctly representative society. We believe the estimate to be a conservative one and the figures to represent the extent of the membership list before the close of 1913 if a society were formed and aggressive measures taken by the executive. The society might be extended, as suggested, by taking into the membership consulting engineers engaged on municipal undertakings.

The conditions under which many of our municipal engineers have labored during the past have been disgraceful. Such a thing is unheard of in England, where the engineers in this field are represented by the Institution of Municipal and County Engineers and other societies. The most libellous statements have been made with impunity about Canadian engineers, where in England, not so long ago, the institution to which we have referred provided funds on behalf of one of its members and secured judgment for him against a councillor who had emulated our Canadian practice of vilifying public officials without rhyme or reason.

The C. S. C. E. has been set upon a pedestal from which it can scarcely be removed. We have heard that it is not its work—that it would be undignified on its part—to investigate the affairs of an engineer and his council; that it stands for the advancement of engineering knowledge, and that it is not trades union. Well and good: it has its functions to perform and it is fulfilling its part creditably; but we believe that there is another and more active part that a well-organized society with good, rich, red blood in its veins could do to equal advantage.

Canada is expanding rapidly and we must look further than the end of our noses. The present appears to us to be the opportune time to lay the foundations of a society which might well do excellent work from the time of its inception and accomplish greater things in the years to come.

We understand that the matter is to come up for discussion at the convention of the Canadian Public Health Association, which is to be held at Regina September 18-20. It is to be hoped that there will be ample discussion of the subject by a representative gathering of municipal engineers.

Competition From the Outside

VIGOROUS protests were forthcoming at a recent meeting of the Victoria Builders' Exchange, convened for the special purpose of discussing the action of the directors of the Provincial Royal Jubilee Hospital in appointing a United States architect to the position of supervising architect in connection with the construction of the new hospital, which is to be erected at a cost of some $350,000, and to which the ratepayers of Victoria alone have voted $250,000. The president of the Exchange, Mr. Robert Dinsdale, took the stand that while the plans should be accepted strictly upon their merit, irrespective of whether they were prepared by Canadian or United States architects, the actual supervision of the work should be entrusted to local people, or at least to a Canadian.

Now we have always come out strongly in favor of home institutions, but we cannot but think that there is something radically illogical about the good people of Victoria if their opinion is voiced by Mr. Dinsdale. The bone of contention is that in the wake of the United States architect usually come United States contractors and United States supply dealers. To overcome this, according to Mr. Dinsdale, it would be necessary to purchase the plans outright and to distribute the rest of the work locally among those having the proper qualifications.

This is a one-sided view that we cannot take. Why pick out the United States architectural profession alone to give us the benefit of experience? Put it another way: why should the architectural profession in Canada be singled out to compete internationally and the contracting community have a closed field? If we can benefit from the one we can benefit from the other. There are improved methods of construction, modern machinery and quick cuts in a hundred ways of execution and organization that are employed by the big firms across the line. Can we not take an occasional object lesson in the practical work? Theory alone will not carry through our great constructional undertakings. The architect and the engineer have their limitations and the contractor has a well-defined and important part to play. It has often been stated by the champions of "Canada for Canadians" that we have all the resources in the way of brains and material that we want. The point is, have we? There are dozens of buildings and other structures throughout the country that attest the skill of contractors from across the border and from even more remote fields. Is it reasonable to assume that in any case the work could have been carried out with equal credit by Canadians? We leave it to the reader and to the special knowledge and experience that he may have acquired in his own particular line of work. For our part, strong as the British spirit is with us, we have always contended that our own people should get the preference only when all other things are equal.

Undoubtedly in this Victoria case the successful architect's plans were selected upon their merit. The selection having been made, surely it would be an impracticable and unwise step to have any other but the man responsible for the plans supervise the work.

As to outside contractors having secured an advantage under United States architects, if this be so then surely we may profit by experience and so frame our conditions as to ensure open and unbiassed competition.

It is interesting upon investigation to note that in this instance the United States architect has maintained an office in Victoria for the last three years and that he is a member of the B. C. Society of Architects. His disposition therefore would appear to be meritorious, even though he were a citizen of another state.

The principle of employing none but our own people and using none other than material supplied by Canadian firms would be an excellent one if we were big enough to put it into effect. Again we ask, are we?

Not so long ago, in the course of a conversation, we were waxing indignant because Toronto firms, apparently, had not been given an equal opportunity to tender on certain work, but our indignation was treated humorously in view of the fact—as we were told—that the magnitude of the job and the problem of financing it had scared all the local contractors into the surrounding country. No local men were on the job or after it.

When we are really as big as we desire to be perhaps we shall be big enough to stand up to any competition. This is a subject upon which we, in common with many of our acquaintance, are beginning to have an open mind.

A One-Hundred-Million-Dollar Programme

If any of our readers have a turn for statistics, let him essay to show what can be done with one hundred million dollars, the amount of expenditure represented by the C. P. R. programme. We are not given to mathematical feats ourselves and we have not the faintest idea how many miles of paving stone could be covered up with one hundred million one-dollar bills; nor could we give a rough guess at the distance they would cover laid end to end, or how long it would take to count them. Nevertheless we are impressed with the stupendousness of the amount. Not only are we impressed but we are gratified to reflect that this great sum is to be distributed among the constructional interests of Canada.

Directly or indirectly each one of us must get a slice of that one hundred millions. Not only will many industries benefit from the direct expenditure of the money, but all will reap some advantage—from the impetus that it will give trade, from the new business that will be created and from the outside investment money that will be attracted.

The unbounded confidence which these great institutions manifest in the future of our country as indicated by their expenditure of these enormous sums of money should convey something to many of us. It is difficult to reconcile the expenditure of such sums with the hesitancy displayed so frequently by those who are considering whether Canadian business is worth the trouble and expense of a publicity campaign.

Full details of the company's plans are not available, but it is known that the development includes double-tracking between Sudbury and Port Arthur, 113 miles, at a cost of $5,300,000; track construction between Brandon and Calgary, 178 miles, $5,000,000; 18 miles of second track and grade improvements between Six-Mile Creek and the "loop" near the Selkirks, $8,000,000; and 139 miles of double-tracking between Revelstoke and Vancouver, $7,000,000.

The Bonus and Penalty Clause

San Francisco has recently adopted a bonus and penalty form of contract under which, the city engineer writes to the mayor, very satisfactory results are being secured as to completion of work on time. He notes, for example, that on a street railway contract the time was cut from 45 days allowed to 25 days, while on a similar contract 48 days sufficed for completing work for which 60 days had been allowed.

These results have probably often been duplicated, and mention is made of them here principally to call attention to the psychological effect of the bonus and penalty clause, though certain other phases are briefly discussed.

As a plain business proposition one would think that a contractor with a fixed sum contract would rush work through in order to release his plant and use it elsewhere. It is the ordinary business method of turning over one's capital as many times as possible. As a fact, however, while this does theoretically appeal to the contractor—in that he recognizes its inherent economies—practically it makes very little difference in his pace. Custom and the particular types of plant used have set a certain speed and so long as that is maintained very little study is given to the elimination of small inefficiencies and the saving of minutes here and there. The release of his plant and the early receipt of full payment do not give just the sort of stimulus that is needed to make the contractor grudge the small losses.

The "hanging up" of a bonus, however, invests the job with the spirit of a game. Not only is there a schedule—he probably had that before—which it will be a satisfaction to beat, but a monetary prize to win. The bonus seems to be a challenge to him to "get under" the mark set, and with the love of a contest inherent in human nature he accepts the challenge. A contractor to whom $1,000 is a bagatelle will chuckle with delight over the earning of a bonus of that amount and brag about it to his friends. He will bend every effort to get it, spurring on his organization and tuning up his equipment to the top notch. The game makes him critical of even small delays, and inefficiency in the use of equipment grows intolerable. The purse looms big and keeps him at it. Oftentimes in his interest in the bonus he fails to recognize that the savings through better management amount to more than the monetary prize. It is recognized, of course, that emergency work, done under very high pressure, is generally costly; but it is the general run of contract in which the completion date is important that is here considered.

While undoubtedly a bonus clause does aid materially in securing the completion of work on or before schedule time, it must not, therefore, be considered as commendable in all sorts of contracts. Often there is no special need for hasty construction or harm from delay, while in other cases the schedule may be so liberal and the conditions as to materials and labor so favorable that there is every likelihood of a competent contractor finishing on time.

The setting of a fair completion date under a bonus and penalty clause, moreover, is not a simple matter. If the time estimate is too liberal, money is unnecessarily spent, while if too short the contract figures will be correspondingly high, and good men may refuse to bid, leaving the work to those who take "long chances." Presumably if the time is very short there will be some counterbalancing benefit to the owner from early completion.

With good records of construction performance it is possible to set fair schedules that will avoid the difficulties and, when the completion date is set, to name a per diem bonus or penalty that will be an incentive to the contractor and be profitable to the owner.

Clogging of Mechanical Filters

Mr. Frederick H. Storer, bacteriologist and chemist to the Louisville Water Company, has dealt with one of the causes of trouble in mechanical filters in a paper presented to the American Waterworks Association at Minneapolis.

It is shown that though it might reasonably be inferred that the operation of the mechanical filter would be easiest at times when bacteria and suspended matter are present in the raw water in the least amount, many filter superintendents are finding that such is not always the case, and that warm weather and clear water bring troubles peculiarly their own, shortening the filter runs and producing odours in the filters. At such times the unfiltered waters are found to contain very minute forms of life, diatoms and a few algae, accompanied by considerable amounts of very fine matter of indeterminate form capable of adhering together in flakes. This matter is supposed to be the result of bacterial action on organic substances. Thus, conditions of clear, warm, shallow water, abundant sunlight and sluggish current afford these micro-organisms the most favorable conditions for development, and their numbers increase rapidly at such times, while the sedimentation basins give the required conditions.

An instance is quoted where, during a period of twenty-six days, the number of micro-organisms present in the unfiltered water remained practically constant; yet during this period the length of the filter runs steadily decreased, and this result was considered as being due to the cumulative effects of a constant number of organisms. When, however, copper sulphate was added to the water in the sedimentation basins there was a general increase in the length of the runs. Also later, when the organisms had died from natural causes, a similar increase in the length of turbidity of the water had remained unaltered, and it was found that the length of the filter runs followed quite closely the variations in the number of micro-organisms present. The manner in which the clogging occurred is described as differing from that experienced with water of greater turbidity.

It was at first believed that with waters of very low turbidity, owing to the fact that the size and consistency of the film formed on the filter surface was reduced, the very fine suspended matter was able to penetrate into the sand in a manner which was not the case with water of greater turbidity, and in the absence of any considerable number of organisms the shortening of the filter runs was first attributed to fine turbidity alone. It was, however, found, on microscopic examination, that the sand generally showed the presence of numerous diatoms and other organisms apparently cemented together in a matrix of amorphous matter and fine turbidity, and the author is of opinion that the living organisms accelerate the formation and retention of this gelatinous film upon the sand grains. Practically, the surface of the sand under these conditions became abnormally hard and compact in a short time, and when broken up the sand grains showed a slight tendency to stick together, and this condition could not be wholly corrected even by thorough washing.

Under these conditions it was considered that some method of treatment should be adopted to prevent the clogging, and three methods were tried, though it seems that only one of these—the successful method—received any great degree of care, owing to the difficulties of application under the particular circumstances. The killing of the micro-organisms by chemicals was attempted, but owing to lack of equipment for applying it accurately as a continuously fed solution, hypochlorite was applied to one of the filter beds in the form of powder. This was done by draining off the filter till about 3 inches of water remained on it, and scattering the powder over the surface and allowing the bed to stand thus for twenty-four hours. The result did not prove to be useful, and the bacterial efficiency of the bed was, moreover, impaired. Copper sulphate was then applied in the second sedimentation basin, and in the coagulant basin, and favorable results were at once obtained. The method adopted was that of dragging bags of the copper sulphate through the water. The third method was that of using the river water without preliminary sedimentation, the water being run direct to the coagulant basins. This was done on two occasions, and in both cases encouraging results were obtained, although in each case an increase in turbidity followed within a few days, and thus left no opportunity to see how long the improvement would have lasted.

The summary at the end of the paper states that the water of the Ohio River, when of a turbidity below 30 parts per 1,000,000, almost invariably causes decrease in the lengths of the filter runs. If such turbidities are accompanied by micro-organism and much amorphous matter, still greater decreases follow. Filter runs may be greately increased by the judicious use of copper sulphate, although after-growths of bacteria sometimes follow its application, and must be guarded against. Small doses of hypochlorite of lime do not affect these micro-organisms in such a way as to increase the length of the filter runs. The determination of the time of filtration of samples of water through small laboratory filters will in some instances enable the operator to select the water from that point of his system which will give the longest filter runs.

Forms and specifications have been issued by the Dominion Government for the construction of a public dock between Salisbury and Commercial drives in Vancouver, on Burrard Inlet, the estimated cost of which will be $500,000. The dock will be of reinforced concrete with a concrete superstructure, having a length of 800 feet and a width of 300 feet.

A 216,000 h.p. hydro-electric development has been started at Nore in Norway. This development will be the largest in Europe. It will utilize the water at the Nore Falls and transmit power to the capital, Christiania, and to the southern part of the country. The power house, which will be 525 feet in length, is located at the foot of a mountain on which forebay and penstocks are placed. A 4-mile tunnel through this mountain connects the forebay with the storage reservoir. The net head is 1,378 feet and the installation comprises eleven 20,000 h.p. and two 10,000 h.p. turbines.

Air Compressor Plant, C.N.R. Tunnel

An Interesting Feature of the Great Undertaking at Mount Royal — The Equipment Described in Detail

By J. L. Busfield, B.Sc., A.C.G.I.

IN order to supply the large number of rock drills employed in the construction of the Mount Royal Tunnel with the requisite amount of compressed air it was necessary to build two plants capable of compressing 5,300 cu. ft. of free air per minute each, at a pressure of about 100 lbs. per square inch. These two plants are located at the opposite ends of the tunnel, one near the Dorchester Street Shaft and the other adjacent to the West Portal, at the Model City of Mount Royal. The former of these plants supplies all the workings from the Dorchester Street Shaft, and the other supplies all the workings east from the West Portal. Both are equipped with similar machines, and are identical except for a few details, so a description of one plant will suffice for the two.

In each plant there are four compressors, three of which are driven by electric motors with belt drive, and the remaining one is of larger capacity, direct connected to the motor. This large compressor has a capacity of 2,000 cu. ft. per minute, and was made and supplied by the Sullivan Machinery Company, known as their WN-2 type, and is illustrated in Figs. 1 and 2. It is of the two-stage, or cross-compound type, the low and high pressure cylinders being 26 and 15½ in. in diameter respectively, with a stroke of 18 inches, the normal speed being 185 r.p.m. A simple calculation will show that at this speed the actual piston displacement of air at atmospheric pressure is 2,040 cubic feet per minute.

The air inlet valves are of the Corliss pattern, operated by eccentrics on the crankshaft, a small amount of clearance is provided at the back of the valves which allows a small film of compressed air to get in and press the valve to the seat, automatically taking up the wear.

The air discharge valves are of the poppet type, and are in the upper edge of the cylinder head, and placed at such a distance from the ends of the cylinder that the piston travels past the openings to the pockets, thus reducing the clearance to a minimum. The valves are of cup-shaped form, guided by an extension of the cover plug, and held in place by light steel springs placed inside the cup of the valve.

To keep the air from reaching too high a temperature both the cylinders are surrounded with a water jacket, in which water is kept in constant circulation. Between the low pressure and high pressure cylinders the air is passed through an intercooler, which consists of a cast iron shell surrounding a number of copper tubes in which cold water circulates. These tubes are placed close together and staggered so that the warm air passing through the cooler is split up in a number of narrow passages between the cold tubes. This inter cooler is shown between the right-hand cylinder and the exciting generator in Fig. 1.

The lubrication of the moving parts of the machine is obtained by means of the splash system, the crank shaft eccentrics, etc., all being surrounded by enclosed chambers.

An unloading valve is fitted on the air inlet pipe. It is of the total closure, double beat type, and is controlled by the air pressure in the receiver. When the pressure reaches 105 lbs. per sq. in. the valve automatically cuts off the entire supply of air, and the compressor runs under no load except friction, reducing the power consumption to a minimum. When the pressure in the receiver drops to 95 lbs. per sq. in. the valve opens fully, and the compressor resumes its full load until the pressure again reaches the maximum when the whole operation is repeated. Experience has shown that this type of controlling valve is more efficient than a valve which permits the compressor to run under a partial load.

In addition to this unloading valve an atmospheric relief valve is placed on the high pressure cylinder to discharge into the atmosphere any air which might be drawn into the cylinder while the engine is running unloaded.

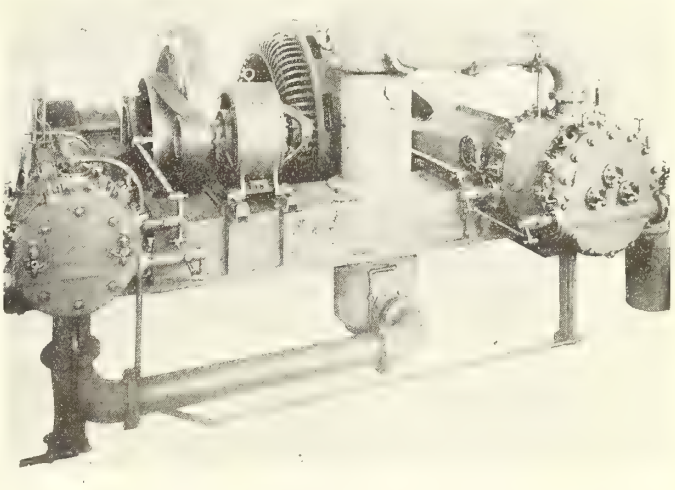

Fig. 1.—Shop view of Sullivan direct-connected compressor.

The compressor is driven by a Canadian General Electric synchronous motor mounted on the same crankshaft. This motor is self-starting, and is capable of developing 400 h.p. with 2,200 volts in the stationary armature. The revolving fields are excited by a d.c. generator belt driven from the main crankshaft at a speed of 675 r.p.m., and delivering the current at 125 volts. The exciting generator can be seen between the two cylinders in Fig. 1.

In order to compensate for the load fluctuations, and to enable the machine to pick up its load quickly, a flywheel weighing 7,000 lbs. is mounted on the crankshaft.

The smaller machines, of which there are three in each plant, are no less worthy of mention, as they are kept in more continous use, and have given very satisfactory service, frequently running from 7 to 9 days without a stop, and with practically no attention.

These machines, supplied by The Canada Foundry Company, are Blaisdell, Class C-2, enclosed frame, self-oiling compressor of the cross compound type similar in operation to the one already described. They have a stroke of 18 inches, and the low and high pressure cylinders are 22-inch and 14-inch diameter respectively, hence with a normal speed of 150 revs. per min. the actual piston displacement of free air is 1,186 cu. ft. per min., but the regular rating is 1,100 cu. ft.

The intercooler on these compressors is placed in a horizntal position over the two cylinders (see Fig. 2) and consists of a number of copper water tubes with baffle plates in a cost iron shell.

The inlet valves are of the Corliss type, operating from eccentrics on the crankshaft, and at the outlets are automatic poppet valves. An unloading valve is located on the inlet pipe and an atmospheric relief valve is situated between the intercooler and the high pressure cylinder. These machines being belt driven the operation of the unloading valves is fairly gradual to prevent too rapid a fluctuation of the load on the belt.

The motive power is transferred by 25-inch double-ply belting from 225 h.p. C. G. E. motors to a 5,700 lb. flywheel on the compressors.

The normal speed of these motors is 600 revs. per min. They obtain energy from a 2,200 volt, 3-phase, 60-cycle circuit, and a pulley 26 inches wide and 28 inches diameter is keyed to the rotatory armature shaft. They will withstand a momentary overload of 100 per cent. or 25 per cent. for two hours. The belt driven flywheel and intercooler of one of these units can be seen on the left of Fig. 2.

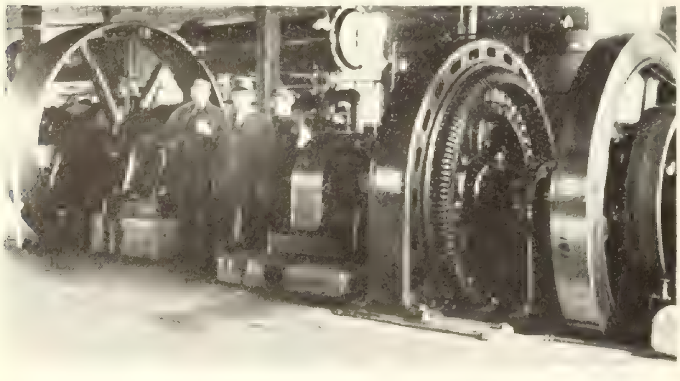

Fig. 2.—Sullivan direct-connected compressor on the right; Blaisdell belt-driven compressor on the left.

A switchboard has been installed for the control of the motors, including all the usual switches, ammeters, voltmeters, rheostats, etc.

The compressed air is supplied by pipes to a number of different types of drills, the commonest being the Sullivan Water Reciprocating Drills of the 2¾-inch and 3⅝-inch size, a number of small hand drills also being employed.

NEW York City has now under construction subways which will cost $81,000,000, aggregating twenty-seven miles in length, nearly all four tracks wide, or a total of 100 miles of track. Fourteen different contracting firms are doing the work and they employ daily nearly 6,000 men. Brick is extensively used in the construction and 225,000,000 will be required in this work. These are the common brick. It is impossible to say how many enamel brick and tile will be required. That depends on the decorative features, which have not yet been made public. It is a curious feature of construction work in New York that many brick are used in the subways under the streets, but none on the streets themselves. New York has no brick streets and the street department has never interested itself in brick for the streets. But even though they have failed in that way, the building above the ground and the subways under the ground are liberal consumers of brick, more so, perhaps, than any other city in the world.

Railroad Bridge Moved to New Site.

THE provincial government of British Columbia recently decided to build a combined highway and electric railway bridge over the Pitt River, a few hundred yards above the point where this stream is crossed by the main line of the Canadian Pacific Railway. While plans were being prepared for the government bridge the railroad company was constructing piers for a double-track bridge to replace the single-track structure across Pitt River. It was suggested that the abandoned single-track railroad bridge, which is a comparatively new structure, might be moved in complete sections and placed upon new piers at the location selected for the government highway bridge.

This plan was found to be feasible, according to the Engineering Record, and the government bought the railroad bridge at a figure said to be highly satisfactory to both parties, as it relieves the railroad company from the necessity of dismantling the structure and makes it possible for the government to open the new highway a year ahead of the expected date. Plans for the highway bridge piers are being revised so as to accommodate the railroad spans, which will fit nicely in the new location, drawspan and all, because the river width is practically the same at both points. The only change in the superstructure moved to the new location will be the construction of a flooring suitable for highway traffic.

The largest span to be moved is the 250-ft. drawspan, which weighs 400 tons. This was taken from its original location on August 20th and placed upon pile supports near the site for the highway bridge. The actual moving was accomplished in less than an hour, four scows being used to float the span, and a tug at each end serving to move it to the temporary supports. The scows were each 30 x 80 ft. in plan and 8 ft. deep and a framework of 12 x 12-in. timbers was erected on each to bring the bearing up to the required height.

When ready to move the drawspan, the scows were partly filled by drawing plugs, so that the framework on each would just pass beneath the floorbeams of the bridge. The scows were placed athwart the bridge, one at either end and one on each side of the pivot pier. On each of the four scows were two 4-in, diaphragm hand pumps, and each pivot-pier scow was also served by a 4-in. steam-driven centrifugal pump, while the outer scows, to which the tugs were attached, were tapped by the steam pumps on the tugs.

The effective width of the bridge resting upon supports was about 20 ft., and this was found to be sufficient to give the span ample stability when floated on the 80-ft. scows, although the upper chord was about 60 ft. above water at its mid point. After being floated the span was towed several hundred yards upstream and swung through a quarter turn. A kedge anchor was then placed to hold it steady in the current, and the line was paid out slowly until the structure was eased carefully into position over the temporary piers prepared for it near the river bank. When in exactly the right position over the rest piers the plugs in the scows were drawn again and the span settled safely to the supports.

Design of a Small, Bascule Highway Draw Span

THE following article treats of a small bascule highway draw span which is operated by hand. Many designs have been made of large, heavy bascule bridges, operated at a very considerable cost, but few small, light spans have been designed where it was necessary to keep the cost down and where the bridge was not opened frequently. The material for this article has been abstracted by Engineering & Contracting from a paper presented before the Boston Society of Civil Engineers, by Mr. L. E. Moore.

General Conditions Governing the Design

Most civil engineers look upon a movable bridge as a bridge pure and simple, with certain machinery for operating it as an adjunct to the bridge. This point of view often leads to designs which are unnecessarily expensive to maintain and in which facility and cheapness of operation are subordinated to certain theoretical considerations which are often given undue importance. It seems to the writer that the proper point of view to take with reference to movable bridges is that they are machines, existing, it is true, only because of the demand for a bridge at some particular location, but designed primarily with a view to cheapness of maintenance and operation as machines, as well as reasonable first cost.

The most important consideration in designing a machine is that it should be as simple as possible; that is, it should contain as few moving parts as possible, and these moving parts should be so arranged that they will not readily get out of order. It should also be, as far as possible, fool-proof.

The writer was engaged by the George M. Bryne Company to design a draw span as a part of a bridge which they had contracted to build for the town of Barnstable. The contract provided that the bridge should be built in accordance with certain plans furnished to the contractor, and contained the provision that the contractor should furnish the design for a steel draw span and build it subject to the approval of the town's engineer. The bridge extends from the mainland to Grand Island in the village of Osterville, in the town of Barnstable, Mass., and replaces a wooden pile structure which contained a double-leaf wooden stringer draw span of the type found quite commonly in this vicinity.

The completed structure consists of four 42-ft. spans of the concrete girder-and-slab type with a central draw span of about 38 feet. The contract plans showed a sketch of a double-leaf steel draw span similar in type to the wooden one which was part of the old bridge; having the usual gallows frames, windlasses and chains for raising the bridge.

The writer found that the bridge was to be operated by hand in a manner similar to the former bridge. As there was only one draw tender, he was obliged to raise one leaf of the draw, get into a boat, row across to the other side, and then raise the other leaf. As it was desired to operate by hand, the double leaf was at once eliminated from consideration because of the awkwardness of operation and because of greater first cost and greater cost of maintenance.

After making several trials of different combinations of girders, the writer settled upon the bridge as shown in Fig. 1. This view shows clearly the type of construction adopted, which consisted of two longitudinal girders having four floorbeams with wooden stringers and a wooden floor of the ordinary type resting upon them. At the mainland end is an axle extending completely across the bridge, supported in bearings resting on the piers. The portion of this axle between the girders was made of two I-beams for the double purpose of cheapness and of having the I-beams act as the fifth floorbeam. The whole structure is counterbalanced by a solid concrete counterweight, the upper surface of which forms part of the floor surface of the span adjacent to the draw. When completely opened, the counterweight swings downward into the space between the two concrete columns at the ends of the draw pier. The draw is opened and closed by the quadrant shown, which is keyed to the axle, and a train of gears.

Figure 1 shows a plan, elevation, and cross-section of the bridge, also a section through the counterweight. As will be seen, the floor is of the ordinary type of construction, having two layers of 2-in. planking on 2 x 14-in. hard pine stringers, spaced 2 ft. on centers. Holes were punched in the top flange of the floorbeam and ¾-in. lag screws were driven into the bottom of the stringers to hold them in position when the draw is open. The stringers abut against the counterweight at their right-hand end, which relieves the floorbeams from any bending in a direction perpendicular to the face of the web when the bridge is open, and also obviates the expensive bracing of these beams. The outer bracket is held by a single hitch angle, and no provision is made for a plate connecting the top flange of the floorbeam to the top of this bracket. The tension upon the connecting rivets is relied upon to hold the bracket in place. Any tendency of the brackets to twist is amply resisted by the wooden stringers, which are fastened to the bracket, and by the plank flooring which is continuous over the entire width of the roadway.

The composition of the girder is shown on the elevation. See Fig. 1 b. It will be noted that the girder is carried back nearly to the extreme end of the counterweight. As stated before, the upper surface of the counterweight forms a part of the wearing surface of the adjacent fixed span. Except for the draw span itself, the wearing surface of the whole bridge is formed by the upper surface of the slabs and is concrete. When the bridge is opened, the counterweight drops, leaving an open well, about 10 ft. long and 15 ft. wide, in the surface of the adjacent fixed span. The outline of the floor is of the shape shown in the plan.

By considering the elevation and plan together, it will readily be seen that when the bridge is opened, the counterweight drops and the bridge rises. Owing to the configuration of the floor, as the bridge rises the flooring over the channel rises away from the flooring of the pier. The counterweight, as before stated, drops away from the floor surface of the adjacent span. The result of this is that the apron so commonly used on wooden bascule draws is entirely done away with, and the operator is only obliged to unlock the outer

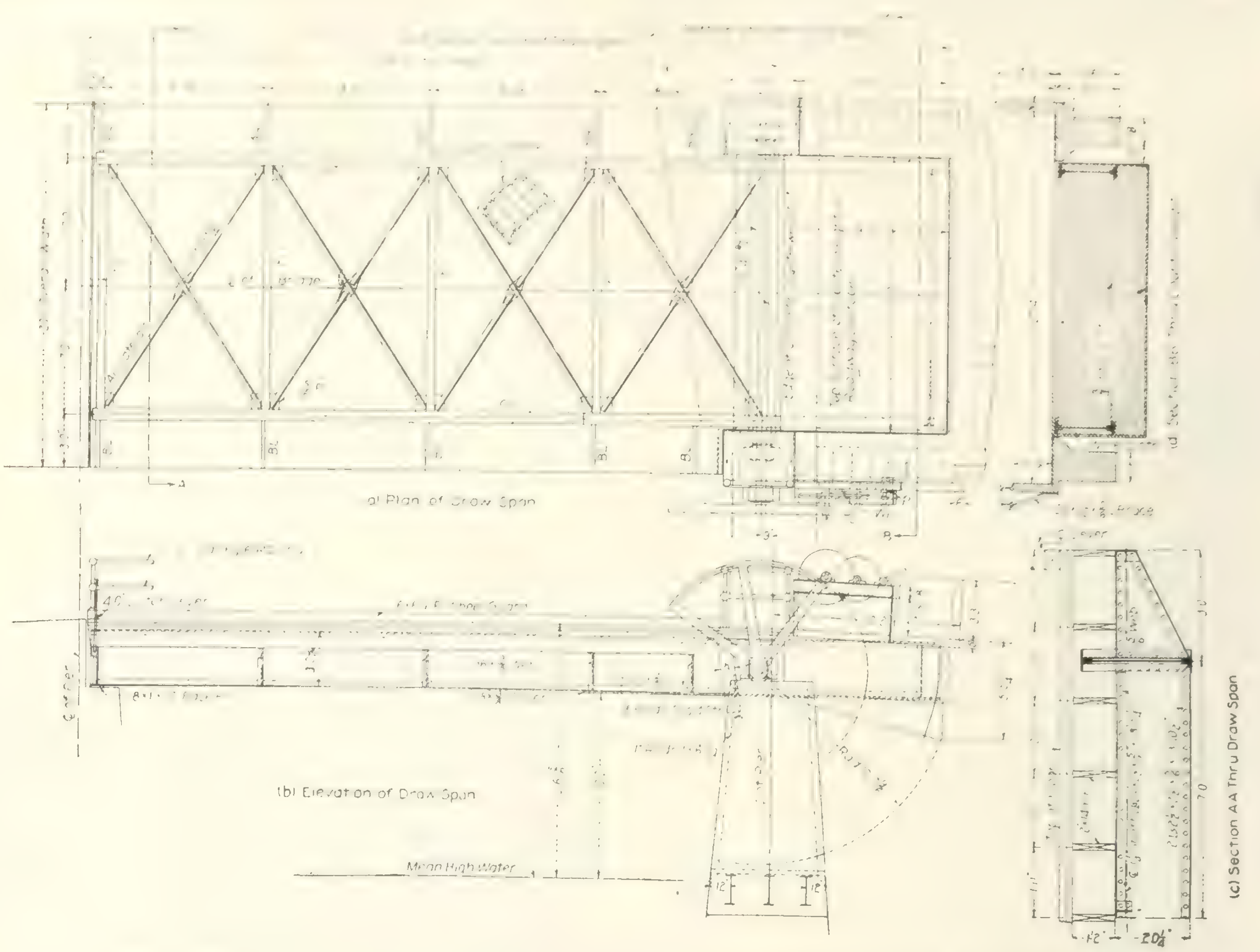

Fig. 1—Plan, elevation and cross section of draw span; also section through counterweight.

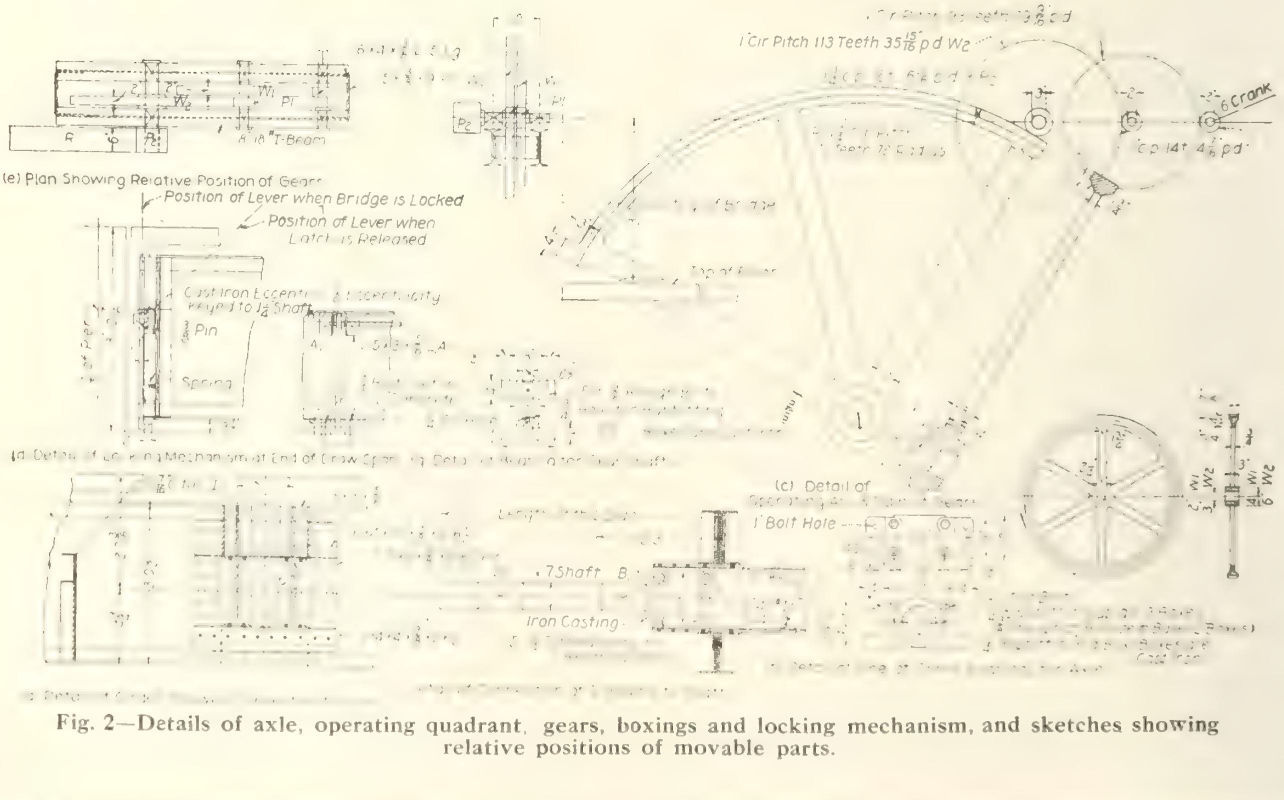
1" Cir Pitch 113 Teeth 35 15/16 p d W2
6 Crank
(e) Plan Showing Relative Position of Gears
8"18" I-Beam
Position of Lever when Bridge is Locked
Position of Lever when Latch is Released
Cast Iron Eccentric
Keyed to 1¼ Shaft
Pin
Spring
(c) Detail of
1" Bolt Hole
.75 Shaft
Iron Casting

Fig. 2—Details of axle, operating quadrant, gears, boxings and locking mechanism, and sketches showing relative positions of movable parts.

end of the bridge and to turn a crank to open it. A portion of the flooring about 3 ft. wide by 4 ft. long over each end of the supporting axle is made removable to allow of ready access to the machinery at any time. The adoption of this type of construction necessitated the re-design of the span adjacent to the draw, making it U-shaped next to the draw pier. The upper surface of the concrete girder on one side is utilized as a space on which the draw tender stands when opening and closing the bridge, and forms part of the roadway surface when the bridge is closed. It is offset, to permit the railing on the draw to swing past the railing on the fixed span.

Operating Mechanism and Counterweight

The axle upon which the bridge turns is composed of two 15-in. 42-lb. I-beams, which extend through a rectangular hole cut in each girder. See Fig. 2 a. An iron casting, of elongated separator, is used between the I-beams at each end and extends from a point just inside the web of the girder to the face of the bearing on the abutment. See Fig. 2, b. A 7-in. shaft is secured in this casting by means of keys and bolts and this shaft forms the journal upon which the bridge revolves. At one end the shaft is made just long enough to extend through one bearing and at the other end it is extended through two bearings and has keyed to it, at its outer end, a gunmetal quadrant which is operated through a train of gears. A detail of this quadrant and its train of gears is shown in Fig. 2, c. The bearings are of phosphor bronze and babbitt. A detail of the three bearings which carry the main 7-in. shaft is shown in Fig. 2, f. By referring to this figure it is seen that phosphor bronze is used in the lower half of the two boxes which are closest to the girder and that babbitt metal is used for the lower half of the third box. The babbitt metal is used in all three of the caps. A detail of the bearings for the gear shafts is shown in Fig. 3, g. A plan of the gears, showing the relative positions of the different gears and of the quadrant is shown in Fig. 2, e. The hand method of operating the bridge can be seen by referring to the elevation shown in Fig. 2, b.

The concrete counterweight is fan-shaped in elevation and completely envelops the girders for the full length of the counterweight. A section through the counterweight is shown in Fig. 1, d. The girders are tied together by angles at their right-hand ends, and a vertical stiffener is put on the inside of each girder to serve as an anchorage for the counterweight. The counterweight was computed as a reinforced concrete beam between the girders and was designed to carry the roadway loads in addition to its own weight. It is reinforced by ¾-in. bars, spaced 12 inches on centers, laid on the bottom flanges of the girders. The lower edge is similarly reinforced, the bars in this case being hung on vertical rods bent over the top flanges of the girders.

Description of Piers

The old solid masonry pier was cut off horizontally at a point just above high water, and two stout concrete posts were carried up at each end. These posts are each approximately 2 ft. 6 ins. by 3 ft. 6 ins. The bearings for the support of the draw span rest on top of these posts, as do the girders of the approach span. Figure 1 shows clearly the way in which the floor of the draw rises, and also shows the removable part of the flooring over the machinery. The sloping concrete bracket at the top of the pier is designed to carry the outer edge of this removable section of the floor. In general, the piers for all the spans, of which the draw span is one, are constructed of split granite with a concrete cap. To prevent any possibility of the draw pier splitting, three 20-in. 65-lb. I-beams were laid on the top course of granite to distribute the weight of the bridge. The concrete which surrounds these I-beams is protected from the action of the salt water by a belt course of granite laid around it and this course was thoroughly tied in by means of iron dogs. The granite course was laid first and was used as the form for the concrete which surrounded the I-beams.

As the upper surface of the counterweight forms a part of the floorings of the approach span, any live load which comes upon it tends to make the outer end of the draw rise. This makes it necessary to lock the outer end. It is also necessary that the locking be done in such a way that the end of the draw is held tightly to the abutment, so that it cannot hammer as a load passes over it. The mechanism for locking the draw is shown in Fig. 1 and Fig. 2, d. It consists of an eccentric carrying an elongated hook. The hook is free to swing about the eccentric, being held against the end floorbeam by a spring. When the bridge is nearly closed, this hook snaps over a loop on the abutment and is then tightened by revolving the eccentric by means of a lever and a rope which extends to the place occupied by the draw tender. The action of this eccentric is to raise the hook, thus drawing the ends of the bridge tightly down onto the wall plates. When it is desired to open the bridge, the rope is pulled and the lever moves, which lowers the eccentric and relaxes the tension on the hook. Just before the extreme motion of the hook is reached, the notched collar strikes a pin on the hook and moves it out clear of the loop. The bridge is then free to open.

Cost Data

The cost of the structure herewith given does not include that of the pier, which should be no more expensive than an ordinary pier having the same depth and height. The itemized cost to the contractor of the draw span is as follows:

Steelwork and machinery, f.o.b. Boston..	$945
Freight, erection and painting	625
Wooden floor	200
Concrete counterweight	225
Total cost of draw span	$1,995

A contractor in Dunfermline, Scotland, recently invented a new type of wall tie. While the tie heretofore in use in this district gripped but two bricks, with the tie invented half a dozen bricks are caught, giving not only additional strength to the wall, but requiring fewer ties and a considerable saving in the bricks used in a large building operation, reports Consul H. D. Van Sant. An additional merit claimed for this tie is that it can be seen before the wall is plastered, thus avoiding any dispute about using less bricks than the number specified by the architects.

In a new process for wood impregnation described by a Canadian engineer diatomaceous earth (a silicious material) is finally ground until 92 per cent. will pass through a 200-mesh screen. This is mixed with melted parafine and naphthalene, and timbers immersed in this mixture for four hours by open vat process. Treated wood is said to resist marine bores as well as decay. The cost of material is said to be about 5 cents a cubic foot.

Importance of Sand Tests in the Use of Concrete

By Cloyd M. Chapman[1]

THERE is no novelty in the assertion that the quality of the sand used in making Portland cement mortar or concrete is a very important consideration. Neither is there anything new in the statement that many of the difficulties, or even complete failures, experienced with concrete which are charged up to Portland cement are actually due to poor sands. But, in the face of repeated assertions of these facts by competent and recognized authorities on the subject, there are still firmly fixed in the minds of many engineers and contractors convictions that "sand is sand," and that a mixture of 1 part of cement, 2 to 3 parts of any old sand, and 4 to 6 parts of broken stone or gravel will make good concrete. The average engineer or contractor fails to realize that slight differences between two available sands which may be used on a piece of important construction may contribute largely to the success or failure of the finished work. This lack of realization on the part of the engineer or contractor, of the importance of the quality of the sand used, is responsible for at least some of the difficulties encountered in the use of concrete, which might be avoided by a better understanding of the subject.

In an Eastern city, the writer found that a sand of very inferior quality had been used in nearly all the construction work carried out during many years. This sand did not develop much over one-half the strength of standard Ottawa sand in short-time tension tests, and yet the question of quality had never been raised by a local engineer or contractor. The sand dealers had never been asked a question relative to the quality of the local sand, nor had they ever heard of the possibility of its being of inferior grade. One dealer in particular had a considerable quantity of sand on hand, which he was willing to dispose of at a low price because it contained coarse particles and was of a dark color. It was not considered a good sand, because of the variation in the size of the grain; and he had experienced some difficulty in disposing of it. Yet this sand, when tested, proved to be of a decidedly higher quality and more suitable for concrete work than other local sands commanding a 50 per cent. higher price. This condition of affairs is regrettable, and it appears to be the duty of the technical press and of technical societies to emphasize the necessity of properly testing all sands entering into important concrete structures.

In the following discussion, the term "sand" is applied to fine aggregate used in mortar or concrete, whether it be a natural sand or an artificial sand produced by crushing and screening stone.

In general, the defects in a poor sand may be classified into the two broad subdivisions of size and presence of deleterious material. The defects of size are chiefly those in evidence where individual grains prove to be either too fine, too coarse, or too uniform. Deleterious matter that may cause defects include organic matter, ores, clay, or other soft or finely divided powder which prevents a proper bond between the cement and the sand. Also, the entire make-up of the sand may be of such a nature that strong, sound concrete cannot be made from it.

Size Requirements.—The requirements as to size are not very strict. By this is meant that no very definite line may be drawn as to the limits and distribution of sizes which are permissible in a suitable sand. For example, a sand may contain as much as 20 per cent. of fine material passing a 100-mesh sieve, and still be first-class; while another may be ruined by the presence of even 5 per cent. of material possessing the same degree of fineness. As a general thing, an artificial sand or crushed stone may with safety contain a greater percentage of these "fines" than a natural sand.

A sand which is too coarse, as, for example, one in which not enough fine or small particles are present to fill the voids between the larger particles, will require an abnormally high proportion of cement to make a strong, dense concrete. Similarly, sand in which the variation or gradation in the size of the particles is within narrow limits will have a high percentage of voids, requiring a large amount of cement to produce god results.

Foreign Matter Requirements.—The requirements as to deleterious matter are much more stringent than those relating to size. The presence of a very small percentage of loamy soil or organic matter in a finely divided state may render an otherwise suitable sand totally unfit for use so long as the organic matter remains in it. The amount of objectionable matter present may be as low as ¼ of one per cent. and still cause serious trouble.

In some cases the presence of small percentage of metalliferous ores in the sand has caused subsequent failure of the concrete in which it was used, by disintegration due to chemical change in the metallic constituent.

In bank and river sands a considerable quantity of clay or other finely divided though inert material is often present. This clay or silt may have been carried down through the sand bed by percolating waters, and so be fairly uniformly distributed through the mass, or it may have been deposited in layers or seams in the sand bed, and then remain more or less distinct and separate from the remainder of the deposit. In some such cases the objectionable strata or seams may be removed when the sand is taken from the deposit. The amount of such material which is capable of causing trouble seems as yet a rather uncertain quantity. In some cases trouble has been charged to as little as 2 or 3 per cent. of silt or clay, while other sands containing as high as 15 per cent. have given excellent results.

The cases in which the material as a whole is unsuitable are those in which the sand is composed of a soft, porous, or brittle substance which could not produce a hard strong concrete even when properly combined with the cement.

The best method of ascertaining the extent to which a given sand possesses the objectionable qualities above mentioned, has never been standardized or fully determined. Although a test is now in use which will show the general quality as compared with the Standard Ottawa sand, yet this test does not show wherein lies the defect of the sand is poor. This test consists in making 1:3 cement-sand mortar briquettes of the sand to be tested, and also of Standard Ottawa sand, and comparing the results of the tension test of these two sets of briquettes. If this comparison were made in compression instead of tension, such a test would be a very valuable indication of the quality of a sand, even though it gave no clue of the nature of the defect in a weak sand.

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[1] Engineer-in-Charge, Westinghouse, Church, Kerr & Company, New York City.

Sand Tests.—Two general classes of tests may be applied to a sand: (1) Tests to determine the general suitability of the sand—that is, the quality of the mortar or concrete that the sand will make. (2) Tests to determine the characteristics of the sand which have an influence on its quality. In the first class belong such tests as compression, tension, and density tests of specimens made up with the sand under test. In the second class are such tests as sifting or sizing, determining amount of silt, organic matter, voids, etc. A sand which gives high results in tests of the first class need not be subjected to tests of the second class, because a sand which makes good concrete may have what characteristics it will.

The details of the many tests which are of use in an investigation of the quality of a sand, vary greatly with different investigators. As a general thing, tests of the first class, designed to ascertain the quality of the concrete or mortar which a sand will produce, consist in making up briquettes of standard size, and cubes, usually 2 in. on a side, of mixtures of 1 part of Portland cement, preferably of the brand that is to be used with the sand on the job, and 3 parts by weight of the sand under test. At the end of 3, 7, or 28 days, or all of these periods, these briquettes are broken in a testing machine, in order to ascertain their tensile and compressive strengths. Similar briquettes and cubes are usually made of the same cement and Standard Ottawa sand, and broken at the same time, in order to secure a comparison between the two sands. As a means of judging its quality, it is commonly required that the sand under test shall show a strength of at least 70 per cent. that of Standard Ottawa sand. Tests of this class likewise include determining the amount of absorption of a specimen of mortar made from the sand under test. This indicates the density of the mortar and its freedom from voids.

As stated above, a sand which shows high strength tests and a satisfactory density need not necessarily be tested further unless one wishes to ascertain the characteristics which go to make up a good sand. If, on the other hand, a sand shows low strength or high porosity, it may be possible, after determining the cause of the weakness, to remedy the trouble and produce a stronger or denser concrete or mortar. If the sand is found to give weak mortar because of the presence of clay or silt, the trouble might be eliminated by washing the sand; or if the product is porous because of a higher percentage of voids in the sand than the cement will fill, the density may be increased by adding a proportion of another sand to produce a better grading of the particles.

Thus, by means of properly conducted tests, it is easy to determine the relative suitability of a sand for use in making mortar and concrete; and in many cases of poorer sands, it is possible to determine, and in some cases remedy, their existing weaknesses. There are, however, many deposits of sand which will not, in 1:3 mixtures, show a strength equal to 70 per cent. of that of standard sand, and which yet contain nothing objectionable for use in concrete. By using a greater proportion of cement with these sands, a concrete of ample strength may be made, which should be in all respects as desirable as another concrete made of a better sand using less cement.

In some localities the only sands available at reasonable cost give low strengths as compared with other and better sands; yet there does not appear to be any good and sufficient reason why these sands should not be used, even in important structures, if sufficient cement is used to give the required strength. This being the case, it would seem that the proper tests to be applied to such a sand should be those that would determine, first, whether the sand contained matter detrimental to good concrete, and second the proportion of cement to be used with it to produce a concrete of the proper strength for the purpose for which it is to be used.

Such a procedure seems to the writer to be the proper one to pursue under these conditions, and the matter is one which merits the attention and investigation of engineers and contractors interested in the subject.—Engineering Record.

Problems of Surfacing in Road Work

THE necessity for building roads to suit the traffic they are to carry has frequently been pointed out, says "Good Roads," and has formed the subject of many discussions. That a road should be so constructed seems obvious, yet it is a fact that in a very large percentage of the road improvement work done, this most fundamental principle is not observed.

Besides negligence, there are other causes to which the unsuitable construction of many improved roads may be attributed. In the first place, it is a matter of some difficulty and expense to determine the traffic which will come upon an improved road. The determination of this involves not only a census for the purpose of ascertaining the traffic carried by the road which it is proposed to improve, but also the making of an estimate of the additional traffic which will be brought to it because of the improvement. And in the taking of a traffic census the character of vehicles using the road and the weight of single vehicles should be considered as carefully as the data on the amount of traffic.

Having made the best possible estimate of the expected travel, it is necessary to select the foundation and surfacing to be put down and decide upon the other features of construction that will give the best results under the existing conditions—not only of traffic but also of topography, climate and the like—bearing in mind, too, the amount available for construction and maintenance. These factors have to be considered together, if the best possible pavement is to be secured at the least possible cost. This, as any highway engineer knows, is a problem far from simple.

Of late years the art of building roads has been undergoing a change, and we have not yet reached the point where it can always be said that a certain kind of pavement is going to give the best results under given conditions of service. A new kind of traffic, automobile travel, must be provided for, and road builders are working with comparatively new materials and are employing new methods of construction. Roads of some of the types that are now being put down have not been in use long enough to demonstrate just what can reasonably be expected of them, nor are there sufficient data of cost and service to justify anything but the most general conclusions, except in some few specific instances. There is great need for experimentation with various types of surfacing under different conditions, and this work should take the form not only of putting down experimental sections, but of keeping the most careful and detailed records of their behavior in service. Much work of this kind has been done; yet there is little doubt that in many cases the construction of elaborate experimental sections has been followed by an inexcusable neglect to keep suitable records.

There is an almost universal demand for road betterment, and there are many evidences that the public—which has to pay for the work—is awakening to a realization of the need of better methods of financing road improvement. There remains, however, a more or less widespread lack of appreciation of the importance of building with forethought. And until the character of the surfacing to be laid down is determined with due regard to the use to which the roads are to be put and not by whimsical preferences, and until foundations are built for the loads they must carry, there will necessarily be large sums wasted in building roads unfit for the service they are expected to render.

Use of Liquid Chlorine in Water Sterilization

THE use of liquefied chlorine gas in water sterilization has only recently been successfully applied to the entire water supply of a city. The trade name of this liquefied gas is liquid chlorine. The commercial process by which the gas is now generated almost exclusively is the electrolysis of brine, which under the influence of the electric current is split up into chlorine and caustic soda.

The chlorine thus generated is subsequently dried, compressed and cooled until it liquefies. In the course of this process the gas is simultaneously relieved of all such impurities as water, carbondioxide, oxygen, air, etc., so that the final product represents the element chlorine in its most efficient form of about 99.5 to 99.9 per cent. purity.

Chlorine in this liquid state occupies only 1/400 of the space of the gas under the same temperature conditions and is placed into steel cylinders of about 80 lbs. weight having a capacity of 100 to 110 lbs. of chlorine. These units of about 180 lbs. gross weight have been found to be the most convenient form for all practical purposes. The chlorine can be drawn off at will by opening the valve on top of the cylinder. It does not matter how much or how little is taken from the cylinder liquid chlorine being the pure compressed gas does not deteriorate or lose in efficiency by storing, as is the case with bleaching powder.

In a recent paper before the American Water Works Association, Mr. John A. Kienle, formerly chief engineer of the water department at Wilmington, Del., read a paper on the use of liquid chlorine in water sterilization. The paper gave the history of the development of this method of sterilizing water and related especially to the application of this method at Wilmington, while Mr. Kienle was connected with the water department of that city. The present article is based on that paper and on information furnished by the Electro Bleaching Gas Company.

The experimental work in water sterilization by means of liquid chlorine as conducted at the plant of the Western New York Water Company, at Niagara Falls, and at the filtration plants at Belmont in Philadelphia and at Wilmington, Del., demonstrated the advantageous features of the use of liquid chlorine and definitely determined its exceptional bactericidal properties, yet, on the other hand, the drawbacks and inefficiencies of the various methods of applying the chemical were forcibly impressed upon the minds of those who attempted its control. The difficulty arose in the development of a commercial and practical apparatus for efficiently regulating the rate of flow of the chlorine gas. Most of the failures on this score were due to the strong corrosive effects of chlorine on all kinds of metals, wood, rubber, etc.

The majority of these when used in the presence of moisture were either totally destroyed or made inoperative in a very short period of time, seldom lasting more than 72 hours. Another and most important feature in connection with the experimental work was the development of an economical method of securing a proper absorption of the chlorine gas without the escape of any to the atmosphere and without loss of efficiency. That chlorine has a remarkable affinity for water is a well known fact, it being possible to absorb in water at ordinary temperatures (60 deg. F.) approximately 2½ volumes, equivalent to 8,000 parts per 1,000,000 by weight. However, notwithstanding this, experience disclosed the fact that upon the liberation of the gas in an open body of water it quickly bubbled to the surface and escaped as free chlorine. The varying heads under which it was introduced also affected the rate of discharge of the gas.

In December, 1912, Mr. Kienle undertook to sterilize water in Wilmington by means of liquid chlorine which he applied by means of a home-made apparatus. The apparatus employed was somewhat crude, but the treatment gave good bacterioligical results. The method of application, however, was not commercially satisfactory and, moreover, parts of the apparatus lasted only a few hours. These experiments resulted in the acceptance by the Wilmington Water Board of a proposition for the installation of an apparatus by the Electro Bleaching Gas Company, who agreed to demonstrate the efficiency of their controlling mechanism for a period of 30 days and to guarantee the apparatus against deterioration for one year from date of installation.

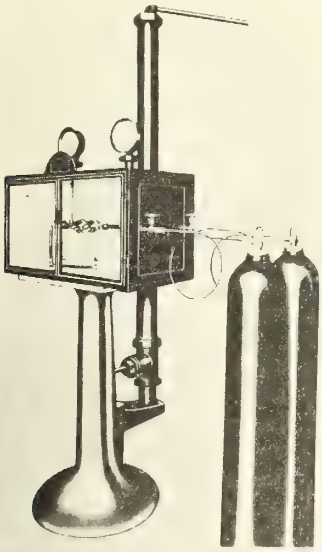
This installation was completed on February 1st, 1913, and since that time has been giving excellent satisfaction. During February the valve controlling the discharge of gas was set at a position which delivered ¾ lb. per hour, equivalent to 1½ lbs. per 1,000,000 gals. of water upon a 12,000,000 gals. daily basis, which was the maximum daily rate of filtration. As this amount was known to be sufficient to eliminate B. Coli no further attempt was made to regulate the rates of flow of gas.

The city at that time was purchasing liquid chlorine in small quantities at the rate of 10 cts. per pound f. o. b. Niagara Falls, while the freight charges and hauling to the plant added approximately ¾ ct. per pound. As four 100 lb. cylinders were connected to the apparatus and the daily quantity consumed was but 18 lbs., the only labor involved in operation was that of changing the tanks once in every three or four weeks, a task requiring about 15 minutes of the filter attendant's time. It is therefore evident that the cost of the treatment is very low, not exceeding in this instance 10½ cts. per 1,000,000 gals. of water treated.

The apparatus employed at Wilmington for the application of the liquid chlorine was described in Mr. Kienle's paper. That particular apparatus is not here described since the apparatus for applying the chlorine has been changed somewhat since the Wilmington chlorination plant was installed.

The accompanying illustration shows the most recent design of the apparatus. It is self-contained with the working parts encased and the absorption tower bracketed at the rear of the pedestal. Where the supply to be treated passes through a Venturi tube an automatic controlling device can be installed in the case which will regulate the supply of chlorine in any desired proportion to the flow of water.

The apparatus here illustrated consists essentially of three parts, namely, a manifold to which the chlorine cylinders are attached, the regulating and controlling valves with indicating gages, and the absorption tower. Next to the manifold is a specially constructed gage which indicates the initial gas pressure. Beyond this gage there are two pressure regulating devices, the first being used primarily to reduce the initial cylinder pressure to a predetermined maximum, and the second for controlling the pressure through a range sufficient to give the desired discharge of gas. A low pressure chlorine gage is attached to a branch outlet on the line between the last regulator and the discharge outlet. This gage is calibrated to indicate the rate of flow of gas in pounds of chlorine delivered per hour. After passing the discharge opening the gas is conducted by composition hard rubber tubing to the absorption tower. This tower is of special design and construction for the purpose of obtaining a complete absorption of the gas in a small volume of water. There is no loss of chlorine in this operation. The chlorinated water solution so formed, utilizes the full efficiency of the chlorine gas. It may be introduced in the water to be treated at any point. The apparatus is constructed of materials which withstand the corrosive action of chlorine. This device is manufactured and marketed by the Electro Bleaching Gas Company, Madison Ave. Building, New York City.



Self-contained type of manually controlled liquid chlorine apparatus for water sterilization.

The experiments conducted at the Belmont filters in Philadelphia demonstrated to the satisfaction of the Water Bureau officials the economic and aesthetic advantages of the use of liquid chlorine as a sterilizing agent. At this plant attempts made by the officials in charge to control the flow of gas with ordinary type of valves proved unsatisfactory. Later the chlorine cylinders were enclosed in an asbestos lined metal box which was heated in order to maintain a more even temperature around the cylinders with a consequent regularity of internal pressures. The gas flow was then controlled by adjustment of the cylinder valves, the quantity discharged being checked every three hours by the use of platform scales.

As the gas was delivered direct to the water in the effluent gate house well and the level therein varied with the fluctuating height of water in the adjoining reservoir from 6 to 14 ft. (approximately), there were numerous periods when a portion of the chlorine bubbled through and escaped to the atmosphere. The bacteriological results, however, were exceptionally good, the count in the treated water ranging from 4 to 10 bacteria per c. c. with negative tests for B. Coli in one c. c. and 10 c. c. samples.

These results were secured with the use of only 1 lb. of chlorine per 1,000,000 gals. of water, which is indicative of the nominal cost of treatment.

At the Western New York Water Company's plant at Niagara Falls, N.Y., experiments with the use of liquid chlorine were begun in November, 1912, under the supervision of Dr. G. Ornstein. Though the bacteriological results obtained from its use are not available at this time it is stated that they are perfectly satisfactory. Economy of operation has also been effected as advices from the plant indicate that the use of ½ lb. of liquid chlorine per 1,000,000 gals. superseded the prior use of 4 lbs. of chloride of lime. In fact, during one period of the experimental treatment covering one week's operation good results were obtained with the use of 1-6 of a pound of chlorine per 1,000,000 gals.

The labor cost for mixing hypochlorite solution was eliminated and prior to the use of liquid chlorine 100 per cent. more sulphate of alumina was used. Irregularities in the original hypo treatment were also overcome by the prevention of the clogging of the pipes conveying the sterilizing agent to the water supply.

At Somersworth, New Hampshire, equally satisfactory results have been obtained though at somewhat increased cost due principally to the lower daily consumption and organic matter in the water. The use of gas at this plant is at the rate of 1/3 lb. per hour, which is slightly more than actually required. This excess quantity is accounted for by the difficulty in maintaining a very low pressure on an extremely fine orifice required for such small velocities, a feature which has been overcome in more recent designs of apparatus.

In Mr. Kienle's opinion the method of treatment described has many points of superiority over the use of hypochlorite. Briefly these may be summarized as follows:

1. Economy in cost of installation. The apparatus is very compact, requiring but a limited floor space, therefore it can be conveniently set up in any existing

building. Storage space required reduced 300 to 500 per cent., due to concentrated form in which chemical is shipped.

2. Labor and power costs in operation practically eliminated. No mixing and agitating of chemical required. Decreased bulk to be handled.

3. Simplicity in regulation of quantity of chlorine applied. No tests required to determine available chlorine in solution. No mineral salts introduced and consequently no difficulties in clogging of orifice boxes and chemical solution pipes with resulting unreliability of treatment.

4. Uniform strength of chemical with increased efficiency and activity. Liquid chlorine is 99.9 per cent. pure and is not subject to deterioration from storage. More active particularly in cold weather with efficiency stated at 1 lb. to 7½ or 10 lbs. of chloride of lime.

5. Disagreeable tastes and odors in treated water eliminated notwithstanding the addition of 8 lbs. of liquid chlorine per 1,000,000 gals., which is considerably more than experience has shown is actually required for sterilization purposes. No residual chlorine is left in water.

6. No provision required for sludge disposal and elimination of corrosive influences of flying lime dusts.

The Patch System of Road Maintenance

ASSUMING that a road shows no structural defects and that the available metalling material is sufficiently hard and tough, the wheel-way can, in general, be maintained in suitable condition by the aid of the patching system, even when the demands of the traffic are considerable in degree.

The fundamental rules that must be applied are the following:

The patching up of the "blow-holes" and small damages to the wheel-way in general must be done after every spell of wet weather. After a preliminary removal of the layer of mud from the hollow in question and a simultaneous roughening of the surface of the latter, in the case of smaller unevennesses only fine-grained and as far as possible cube-shaped metal material of from 1 to 3 cm. size of grain is to be used and the cement addition (stone-splint, grit, or sand) of the same material as the metal is to be restricted to a minimum. The use of road mud or of other earthy or clayey constituents is to be avoided.

The quantity of the patching-metal material is to be so chosen that it reaches up to or somewhat above the edge of the hollow. The individual grains of metal are here to be laid very closely together and in as even a layer as possible, the surface of which projects slightly above the adjoining wheel-way surface, but only so much that, on the pressing down of the patching layer, the original level of the surface at this point is reached, and that, after consolidation, neither a lump nor a hollow remains behind. The height of heaping of the metal required depends upon the quality of the material of the latter and mainly on the compression strength of the wheel-way.

Care must, moreover, be taken in the base of deeper "blow-holes," that, beyond the edges of the hollows, and especially in the direction of motion of the vehicles, i.e., of the axis of the road, quite small-grained metal is arranged, so that a ramp-like transition is provided for the wheel-tires, the thumping action of the latter is diminished, and the uniform pressing together and ramming down of the layer of metal is promoted.

Pieces of metal squeezed out or pushed aside by the horses' hoofs and wheels from the patching places are to be reinserted, whereby the strips that have already been driven firmly in by the wheel-tires are not to be injured and are as far as possible to be left entirely undisturbed, except in cases in which they have cut so deeply into the wheel-way that they can bear a fresh covering of small-grained material. In the application of the metal the patch must, in general, be made to take a form that is elongated in the direction of the axis of the road or direction of motion of the traffic, and experience teaches that little round unevennesses must also be metalled-up in this way.

This stands in connection with the circumstance that the wheeling down and pressing together of the metal by the weight of the wheels takes place in the longitudinal strips. Since the grains of metal at the edges rest on harder, less softened parts of the wheel-way, these are exposed in an increased degree to destruction or crushing into small fragments and are at the outset intended to effect the transition between the old wheel-way and the new layer of metal. The further these transition areas are extended in the longitudinal direction of the road—of course up to a certain practical limit of about ½ to at most 1 m. from the edges of the hollows—the shallower and more gradual will be the inclined plane up which the wheels have to run, and the more favorable are the conditions for the rolling down of the patches by them. Similar conditions prevail in regard to the sides of the patches, which may also with advantage be bounded by transitional strips of small-grained metal. The sole purpose of these edgings, however, is the attainment of a better cohesion of the metal and to prevent the lateral slipping and rolling away of the stones.

In regard, now, to the main metallings annually carried out on the patching system, care must, in the first line, here be taken, that an ample supply of broken stone, if possible, of two kinds, of about 3 and 6 cm. size of grain respectively, so that the patching, which, according to the condition of weather of the expired period of maintenance, may require a very variable quantity of metal, may be carried out in accordance with the actual requirements and in a proper manner, and that the necessary levelling and filling up of the section of the wheel-way may not be neglected on grounds of momentary economy—a procedure which is apt to bring its own punishment during the succeeding period of maintenance. It is, indeed, here that the economy of the patchwork maintenance lies, that, at a time at which a stretch of road is very much worn and requires a great deal of metal to bring it into good condition, the quantity of material needed for the maintenance of the transverse section of the road in a favorable manner is duly applied; a result of this, meanwhile, is that for the next few years the requirements of material for a road thus amply metalled will be considerably diminished, while, in the opposite case,

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*From a paper by Zdensko Vytvan, Brunech (Tyrol), presented at the Third International Road Congress.

in spite of the yearly bedding-in of a uniform and pretty large average quantity, a like success will not be attainable.

The supply of metal to be provided must be so large that, after the main patching is done, a small reserve of metal, in particular of the small-grain kinds, is left over, which is then heaped up on storing places along the side of the road ready to hand for urgent local repairs that may become necessary in the course of the complete year—especially during a time of long-continued wet weather. Similarly quite small-grained metal—of from 1 to 3 cm. size of grain—and the corresponding cement material that may be needed for the repair of "blow-holes" and small unevennesses must at all times be held in readiness at the depositing places in close proximity to the road.

To avoid a hampering of the road traffic over a long stretch on the occasion of the main metalling, it will be advisable, at a place where a roller is not used for the rolling down of the often very extensive patch-layers, to resort to a systematic subdivision into shorter stretches of about 500 to 600 m. of such description that metallings of large extent with corrections of the section only occur on certain stretches in one year while the remaining sub-stretches are alternately subjected to a main metalling in the next two or three years.

It is of especial importance that, immediately before the metalling, which is to be undertaken only at a time when the wheel-way is soft and damp, the mud be removed from the road.

For the metalling operation itself, it is regarded as the principal rule that the larger stones be in all cases bedded in the deep ruts and in the middle parts of the wheel-way that are most run down, and that the small-grained ones be used on the side strips of the way and for the filling and levelling up of minor unevennesses.

Should certain places—in particular ruts—be specially deeply worn down the bottoms of these should be bedded out with special care with large lumps of stone laid as close together as possible and covered over with a layer of medium-sized metal-stones.

This second layer serves at the same time to make the top of the patch even with the adjoining surface, and is to be extended with a downward slope over the edges of the defective spots. In the arrangement of the patch surfaces, the form of the wheelway surface must be kept under careful observation and the work must be carried on under the constant supervision of an experienced road-man.

Track-Metalling

When a case of decided track-metalling is in question, i.e., of metalling up of parallel ruts in combination with side strips of patch-metalling for the leveling up of the section, it is advisable also to cover the rounded longitudinal ridge between the ruts with a very thin layer of medium-grained metal in such a way that only a very narrow strip of about 15 to 20 cm. in the middle of these raised parts remains free.

Although this layer of metal is not very durable and is for the most part knocked aside by the horses' hoofs, so that the individual grains of metal only remain over for bedding and filling purposes, the measure in question effects the practical object that the draught-horses, which otherwise avoid the metalled ruts and only make use of the raised stoneless intermediate strip, are misled in the keeping of the course that is by these means rendered less recognizable, and the wheels of the vehicles in consequence move more in sinuous lines.

By this means the successive wheeling down of the metal from the bulged-up strip towards the ruts is promoted and the wheels get on the freshly metalled ruts much more often than they could otherwise be got to do. If the edges at each side of the rut metalling have once been rolled firmly down and become covered with mud, the stone material in the former ruts is so tightly pressed together and boxed-in from the sides that it can no longer escape, and the middle parts of the track, which can then be traversed without any great amount of friction, very soon become firmly rolled down.

The procedure illustrated in connection with the mending of the track shows in a typical manner how the consolidation of layers of metal is effected. As will be shown further on, it also gives a very good idea as to the manner of mending "blow-holes" and irregular defective patches.

The second kind of metalling-up of patch-system roads, which is adopted where no ruts or only very shallow ones occur and where the wear shows itself for the most part in "blow-holes" and unevennesses, consists in the laying of irregularly formed patches of metal of different thicknesses; its use for the most part is confined to very broad wheel-ways. This requires considerable practice and special diligence in the laying of the metal patches. The different patches may here be profitably connected together in long-drawn surfaces of metalling of considerable size, which often extend over half or the whole of the wheel-way, and the removal of the unevennesses is effected by the application of thicker or more large-grained covering-layers at the places concerned. The procedure described in connection with the metalling up of "blow-holes" is thus repeated, though in a somewhat modified manner, in so far that the separate transition surfaces between the edgings round the damaged places are drawn together, so that they only occur before and behind and at the outer sides of the combined patch of metalling.

Arrangement of Surfaces

In what form can these patch-metal surfaces now be most advantageously arranged?

As already mentioned above, the metal material at the front and back edges of the patches, i.e., at those transverse to the axis of the road, which have to receive the shock of the wheels at the points of transition from the smooth unmetalled wheel-way to the rough and somewhat raised surface of the layer of metal, is stressed in a particularly detrimental manner, so that the rolling down of these edges by the traffic weights is effected with much greater difficulty and much less evenly than that of those that lie parallel with the axis of the road (side edges), as is particularly well shown in connection with the rut-metalling described above.

The reason for this is to be found principally in the axial direction in which the wheels of the vehicles move; that is to say, in the circumstance that the pressing down and consolidating of the metal everywhere takes place in the narrow parallel strips produced by these.

A wheel that cuts through the metalled surface will only be able to assist in rolling down the metal at the narrow places of entrance and exit, while, during the rest of the way, it will more or less plough into and up-heave the material, unless the lateral escape of the latter is prevented. A longitudinal strip that cuts through the metalled surface cannot be consolidated unless it has undergone long-continued wheel-pressure combined with repeated filling with fresh material. When, on the other hand, a wheel indentation lies pretty much along one side of the metalled surface, it will assist in the consolidation and in the getting on to the metal throughout the distance traversed.

Considering, then that as experience shows, a layer of metal can be most effectively wheeled firmly down when this phenomenon at the points of transition (edges) to the unmetalled surfaces begins and is continued towards the middle, care must, in the applications of metal for the attainment of firm durable covering patches, above all be taken, that a quick consolidation of the side edges takes place, by which at the same time the rapidity of the rolling down of the whole surface can be considerably increased.

As has been successfully tried, this purpose can be effected by the expedient of extending the metalled surfacing at several places of this kind, with due regard to the locality of the patches, and forming them to such a manner that they consist of longitudinal strips that run parallel, but are shifted one with another.

In stretches, where the wear shows differences of no very considerable amount and extends principally over the central strip of the road, the latter can often with advantage be covered in a width of about 3 m. in breadth with a layer of metal, and the patching work proper be effected by a suitable distribution of the pieces of metal during the rolling in.

Another rule which must be closely followed in the laying of the metal on the patch system is the careful looking after of the surfaces covered up to the point at which they are run onto. This takes the form of constant filling and leveling of the tracks and ruts formed, and of collecting the scattered grains of metal and applying them to depressions or bare places, a light blunt iron instrument being used therefore. By this, however, the places that are already consolidated will not be disturbed, only the loose metal is in so far to be distributed and shifted about as may appear desirable for its suitable rolling in and as may be necessary for the attainment of the desired height and firmness of the places patched.

Finally, in the maintenance of a metalled road on the patch system all the well-known rules and experiences for the construction and maintenance of metalled roads in general are to be rationally observed .

THE Australian government is constructing a railway line 1,063 miles long between Kalgoorlie in West Australia and Port Augusta in South Australia. The purpose of the line is to bring Western Australia in touch with the eastern states. The railway will be government owned and will be constructed by day labor, but with the exception of 1,500,000 sleepers, the materials for construction are being supplied by private parties. Work is progressing from both ends of the line. There are very few engineering problems in connection with the construction but there are serious difficulties of another nature. The government will have to arrange for the supply of water, food, medical attention, clothing and amusements of all the men engaged immediately they get away from Kalgoorlie and Port Augusta. The absence of water along the route will be overcome for 295 miles by gravitation from Kalgoorlie. For 700 miles water will have to be obtained by conservation, boring or transport. The line will cost $20,000,000.

City Manager Plan

THE city manager plan is gaining ground, comments Engineering and Contracting. Last month two large cities in Ohio—Dayton and Springfield—adopted new charters which provide for the commission-manager form of government. The Dayton system provides for a commission of five members elected at large for a term of two years. They are nominated by petition and are subject to recall. The head of the administration is a city manager, who is appointed by the commission for an indefinite term, subject, however, to recall within six months after he takes office or to removal by the commission at any time. The charter provides that the city manager shall be appointed without regard to his political beliefs and that he necessarily need not be a resident of Dayton when appointed. This manager appoints all heads of departments and is responsible for the efficient administration of all departments. Dayton and Springfield will do well to bear in mind that much of the success of the plan in the cities where it is now in operation is due to the fact that the city managers are engineers.

Limiting Height of Building in U.S.

The following is a partial list of the restrictions as to heights of buildings enacted by cities and towns in the United States:

Baltimore—Fireproof buildings limited to 175 feet, and non-fireproof to 85 feet.

Boston—Two and a half times the width of the street, the maximum being 125 feet.

Buffalo—No height greater than four times the average of least horizontal dimensions of the building.

Chicago—An absolute limit of 200 feet.

Cleveland—Two and a half times the width of the street, with maximum of 200 feet. Recesses or setbacks to be counted as added to the width of the street.

Denver, Colo.—Not to exceed twelve storeys, and those more than 125 feet to be fireproof.

Jersey City, N.J.—No building or structure except a church spire shall exceed in height two and a half times the width of the widest street upon which it stands.

Los Angeles—A limit of 150 feet.

Newark, N.J.—Not to exceed 200 feet, but warehouses and stores shall not exceed 150 feet.

New Orleans, La.—The height at the street line shall not exceed two and a half times the width of the street which the building faces. Setbacks are to be counted as added to the width of the street.

Paterson, N.J.—Warehouses and stores must not exceed 100 feet in height.

Portland, Ore.—All buildings except churches are limited to 150 feet.

Scranton, Pa.—The limit is placed at 125 feet.

Ninety per cent. of rail failures, as stated by Mr. M. H. Wickhorst, engineer of tests for the rail committee of the American Railway Engineering Association at the recent convention of the association, are failures either of the head or web, which constitute 50 per cent. of them; or of the base, which constitute 40 per cent. The cause of the former he ascribes to unsound ingots, and the remedy he says is a more uniform chemical structure in the ingot. For the base failures he blames laminations in the base, and suggests as a cure better mechanical rolling.

Canada's Great Inland Ports

Port Arthur and Fort William—Live Facts Which Emphasize Their Importance in the Constructional World

DURING recent years the industrial and constructional activities of Port Arthur and Fort William have brought these great inland lake ports into much prominence. These cities are situated at the head of deep water lake navigation and are 1,200 miles by water and 1,000 miles by rail from Montreal, to which port a passage of 14 feet in depth is open. This depth allows vessels with a carrying capacity of approximately 2,500 tons to navigate, and makes possible the receiving at Montreal of a vast amount of grain and western products, which without this cheap water route would find its outlet via Buffalo and other American seaports. With the deeper channel available which is now being advocated, thus making possible still cheaper transportation, Montreal will not only still further increase her western grain receipts, both Canadian and American, but will control it for the American route, which now receives over 40 per cent. of Canada's European-bound wheat shipments.

Thunder Bay, on the shores of which the city of Port Arthur is built, is a magnificent body of water, 16 miles wide and about 35 miles in length, and is surrounded, except for two entrances to Lake Superior, by bold and rugged hills.

Fort William is situated in lowlands bordering the Kaministiquia River, and lies almost under the shadow of Mount McKay, which rises to a height of 1,000 feet and which forms parts of a long range of hills which lie directly to the south of that city. On the range of hills is Loch Lomond, the source of the water supply for Fort William, a beautiful lake over 5 miles long and situated 600 feet above the level of Lake Superior, only a few miles distant. Port Arthur begins at the northern boundary of Fort William, directly on the shore of Thunder Bay a site which is unsurpassed, rising as it does in gradual terraces from the lake level to a height of over 400 feet, giving a panoramic view of hill, lake and stream covering approximately 2,500 square miles.

Fort William's harbour facilities are splendid. These, with Port Arthur's more open water-front, where ice does not form too excessively to prevent loading during all the winter months, make a harbour which it would be difficult to surpass. The river is navigable for deep water lake vessels for about six miles, and from that point to the lake, two more outlets are available, the Mission and the McKellar rivers, both of which are now being deepened for the passage of large ships, making altogether about 35 miles of water-front which is possible for docks, and all not more than 6 miles from the central point.

At these ports are the great transfer points for grain shipments from the west to the east, it will be taken for granted that the facilities for handling grain are as complete as possible, and such is indeed the case, for Port Arthur and Fort William are now leading the world not only in the grain storage and handling facilities in completion, but also in elevator construction. Barely eighteen months ago the grain storage capacity of these ports was approximately 25,000,000 bushels, and now, when present contracts are completed, it will be approximately 42,000,000 bushels. This stupendous construction in elevator storage capacity will have to be continued in order to keep abreast of the grain receipts which are increasing by leaps and bounds, as illustrated in the lake wheat shipments alone which in 1911 were approximately 70,000,000 bushels and in 1912 97,000,000 bushels.

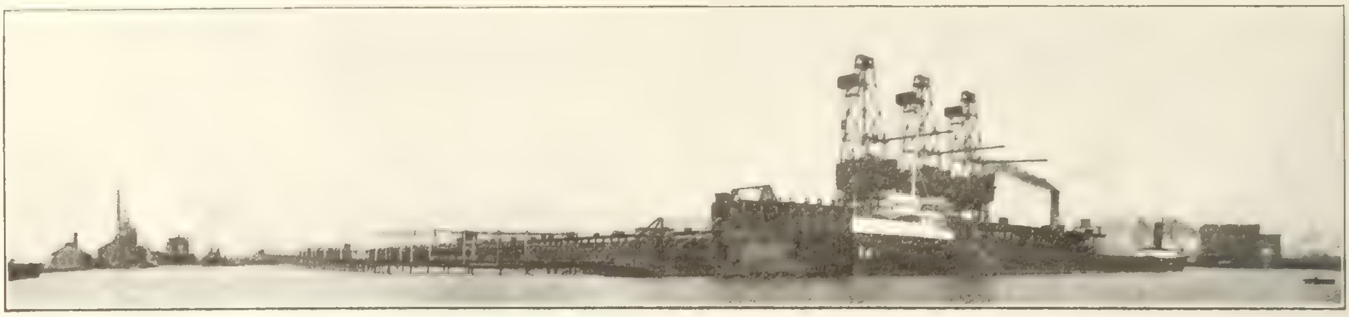
Port Arthur has 40 per cent. of this vast storage capacity, which includes the world's greatest elevator with a capacity of 9,500,000 bushels. This building is only one of 14 large terminal elevators.

These cities have also three of the finest coal dock plants on the continent, at which it is possible for a 7,000 ton cargo of coal to be unloaded within the 10 hours. The Canadian Northern coal dock at Port Arthur has a storage capacity of 750,000 tons. At Port Arthur the finest dry dock in Canada is situated, having a length of 736 feet, the property of the Western Dry Dock and Shipbuilding Company.

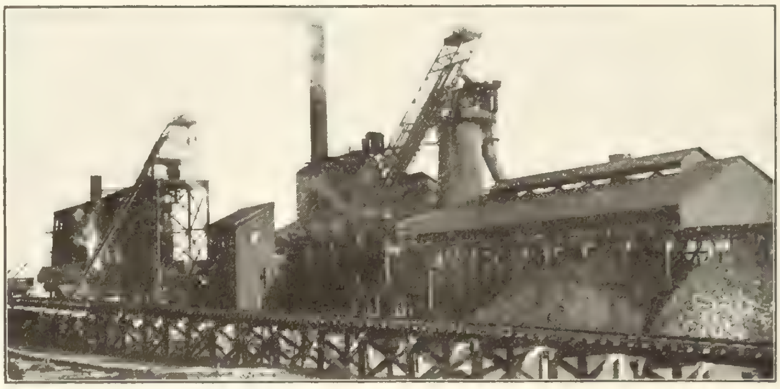
Mammoth Steel Plant Contemplated

Port Arthur, at the request of the MacKenzie and Mann interests, is reserving 300 acres out of the 1,300

Section of the waterfront terminals at Port Arthur.



Coal docks of the Canadian Northern Railway and section of the waterfront at Port Arthur.



The Atitkokan Iron Works, a well equipped industry whose plant is situated near Port Arthur.

The Canadian Northern elevator at Port Arthur, Ont. This building has a capacity of 10,000,000 bushels and is said to be the largest in the world.

CANADA'S GREAT INLAND PORTS

acres of free industrial sites which the city possesses. These 300 acres are destined for what is to be the largest steel plant in Canada. It is to cost in its initial stage over $5,000,000, and when the plant is fully completed, with the addition of subsidiary plants, it is estimated that the cost will amount to over $10,000,000. This steel plant is the culmination of a series of experiments which big European steel interests have been making with the local iron areas, which exist in almost inexhaustible quantities.

Building Activities

There is under construction at Port Arthur at the present time a $75,000 church for the Presbyterians. There is also about to be commenced in the same city a $100,000 church for the Roman Catholics. The new Italian Church, which was commenced last year will be completed this season.

Kakabeka Falls, the source of Fort William's light and power.

The erection of commercial blocks and dwellings is also progressing. Fort William has under construction the new Commercial Chambers Block, which is to cost about $250,000. Port Arthur has the Port Arthur Building under construction, a modern ten-storey fireproof structure, which will cost over $400,000 when fully completed. An armoury is also being built at a cost of over $150,000 at Port Arthur. Dwellings are being erected rapidly to meet demands, it being estimated that so far this year over $500,000 has been spent in Port Arthur in the erection of two hundred modern residences. The value of new buildings in Port Arthur will amount to over $4,000,000 this year.

Cutting off piles under water was accomplished by the use of an air drill in the work of rebuilding a railroad bridge some time ago across the Pitt River, in British Columbia. Piles in an old pier had been driven in a double row so as to form a sharp-pointed ellipse, and in the reconstruction work it was necessary to cut off the inner row 1 ft. lower than the outer row. This fact, coupled with the depth of water, which was 25 ft. at high tide, prevented the use of any ordinary method of sawing. The work was done by Mr. H. A. Bayfield, of Vancouver, by the use of a Little Giant compressed-air hand drill operated by a diver and supplied with air from a floating plant. The diver commenced work on the outer row, and, taking one pile at a time, drove 2-in. holes at the required depth until the pile was so weakened that it could be pulled over by a rope attached to the top. With the outer row out of the way, the same method was used to cut off the inner piles at a lower level, and these were removed in the same manner. On page 717 of this issue of the Engineering Record is a description of the methods of putting in the foundations for the Pitt River bridge near Vancouver.

Economical Proportioning of Concrete

By Sanford N. Thompson

ECONOMICAL proportioning of concrete does not always consist in causing the leanest possible mixture. If the quantity to be laid is small, it is sometimes cheaper to use materials at hand, selecting the proportions arbitrarily and adding an excess of cement to insure the required strength and water tightness, rather than to make the tests required for the more scientifically proportioned mixture. On the other hand, upon large or important work, it pays from the standpoint of dollars and cents to make thorough studies of the aggregates, carefully grading the materials so as to use the smallest possible quantity of cement, which is always the most expensive ingredient.

This fact has been seriously overlooked in the past, and thousands of dollars sometimes have been wasted on single jobs by neglecting laboratory tests and studies or by errors in theory. By adjusting the proportions of the aggregates instead of selecting them arbitrarily, a concrete of equal density, strength and water-tightness may be made almost always with the use of less cement. On a certain job, for example, where water-tight concrete was required, a net saving was effected of 74 cents per cubic yard by carefully grading the materials, the resulting concrete being as watertight as the richer mixture, having proportions selected by judgment.

The Associated Metal Lath Manufacturers, Youngstown, Ohio, have issued standard specifications for exterior plastering which represent exhaustive research and constitute the last word in this construction. This type of work has been retarded in the past owing to failures due to improper methods. The constructional interests generally, however, are coming to look upon exterior plastering with increased favor and the reliable information afforded by this document is timely in its presentation.

Mr. T. G. Holt, general manager of the Canadian Northern Pacific Railway, has awarded the contract for the construction of the railway from Patricia Bay to the entrance to the Songhees Reserve terminals at Victoria, which will complete the Island link in the rail and ferry service between Vancouver and the provincial capital. The successful bidders for the contract were Mr. J. Macdonald and the Littleton-Bruce-Elsback Company, the work embracing a joint contract. The distance covered by the work is about twenty miles from Patricia Bay, formerly known as Union Bay, on the north-westerly shore of the Saanich Peninsula, to a junction with the main line of the railway. The same contract also covers the work from mile 4.7, outside Victoria, through the city and up to the approach to the terminals on the old Songhees Reserve.

Calgary's Record Well-Maintained

Building Permits Still Being Issued to the Value of One Million Dollars a Month—The Work in Hand

Correspondence of the Contract Record

Calgary, September 10, 1913.

CONDITIONS in the building world of Calgary continue to show improvement, reflecting the improved financial markets throughout the Dominion. While not up to the totals for 1912, building permits continue to pour in at the rate of over $1,000,000 each month, the total for the month of August being $1,083,530. The whole tone of the contracting field is improved, and about the same amount of men are employed this year as last. The most noticeable falling-off in building has been a decrease in the number of houses built for speculative purposes. One feature of the larger buildings now under construction is the increased number of reinforced concrete structures required by owners. There are now under construction in this city twelve large buildings having reinforced concrete frames. The largest is the ten-storey office building for the Herald Publishing Company, costing over $400,000, while the smallest is the new theatre for the Canadian Film Exchange, Limited, costing $75,000, in all aggregating a total cost of over $2,000,000.

New Bijou Theatre, Calgary.

One result of the increased amount of concrete being placed, not only in buildings, but in the street paving, has been to render the question of suitable materials very acute. Heretofore contractors and architects have been content to accept bank run gravel for aggregate for concrete of all classifications, but following the lead taken by the City Engineer, requiring all materials to be washed and graded, there has been an increased demand for better materials. In order to fill the demand, there have been incorporated in the province of Alberta, during the current year, for operation in Calgary, at least four new companies dealing exclusively in sand, gravel, or crushed rock, with a total capitalization of over $125,000. There have been besides about five other companies in operation, all using machinery. One of the most interesting of these developments is that of the Alberta Gravel Company, Limited, of which J. J. Wilson, of Calgary, is the president. This company is operating on the Bow river, in the heart of the city, and is removing the gravel from the river bed by means of a one cubic yard Hayward orange-peel bucket travelling on a steel cable back and forth across the river. The cable has a span of 550 feet, and is 1¾ inches in diameter. The materials are dropped over grizzly bars and washed and screened before dropping into the bins below. The bins have a capacity of 100 cu. yds., with six gates for loading six teams at once, giving the plant a capacity of 400 cu. yds. per day. Two plants, installed west of the city, will sluice materials from the hillsides down to washing and screening plants loading by gravity to cars.

The New Bijou Theatre

Among the more interesting buildings to be completed recently is the new Bijou moving picture theatre, a cut of which is shown. The building occupies a lot 25 feet wide and 130 feet deep on Eighth Avenue, in the heart of the business district, and cost about $50,000 complete. In all its arrangements, the theatre represents the most advanced ideas for this class of building, and is a well paying investment to the owners. The frame is structural steel, with laminated floors. Seventy-five tons of steel, supplied by the Hamilton Bridge and Iron Works, Limited, were erected by the contractors, McDougall & Forster, Limited, of Calgary. The front elevation is entirely of ornamental plaster, with marble wainscotting. Besides the main auditorium, there is a balcony, suspended from the roof beams by steel rods, the theatre having a capacity of 650 persons. In addition to the ordinary features to be found in such buildings, this theatre has a motor-generator set for supplying electric light and also power for running the fans for the forced draft heating and ventilating system installed. All electric lighting is indirect, with large bowl fixtures suspended from the ceiling of the auditorium, and provided with weighted pulleys so that the fixtures may be lowered in order to replace the lamps. The architect was James C. Teague, of Calgary.

Important Bridge Work

The city of Calgary are advertising by-laws to be voted upon September 27th next for the reinforced concrete bridges formerly contemplated, as well as for the erection of an industrial building, to cost $250,000, for the housing of small manufacturing businesses, and similar to the well-known Bush Terminal Warehouses in New York. The largest of these bridges will be the high-level bridge across the Bow River at Center street, for which the sum of $468,900 is required. Those most likely to be authorized, certainly those most needed, will be the three-span bridge at Fourth street west, over the Elbow River, requiring $82,500, and another to replace a three-span steel bridge over the Bow River, requiring $173,000. By-laws for other public works will bring the total of the by-laws to be submitted to almost $1,500,000, It is not probable that all of these will be adopted, but at least two or three of the bridges will be constructed during the coming year.

McDougall & Forster, Limited, of Calgary and Edmonton, have about completed the contract for a new hotel on Seventh avenue east. The building is six storeys high, with basement, and is 50 feet wide by 130 deep and 83 feet high above the sidewalk. There will be a total of 95 rooms available on the five upper floors. The lower floor, which will be rented for store purposes, has a unique feature in the lobby in front of the showcase window. A deep plate girder having a span of about 35 feet, in the front of the building allows the window to be recessed from the street line, enabling passers-by to step into the lobby thus formed to view the displays and also enlarging the prism-light area for the basement. The foundations of the building are of concrete, the superstructure being structural steel with laminated floors. The front elevation is white terra cotta, supplied by the Washington Brick, Lime and Sewer Pipe Sales Company. The exterior walls are of common red brick and were laid complete the full height of six storeys, a total of 420,000 brick in 15 days. The interior partitions are of gypsum block. One passenger elevator is being installed. Two hundred and fifty tons of structural steel were supplied for this building by the Hamilton Bridge & Iron Works, Limited, of Hamilton, Ont., and were erected by the contractors in the short period of 18 working days. One 7 in. by 10 in. American steam hoisting engine operated the two derricks used, a 15-ton stiff-leg, with 80 ft. timber boom, and a 5-ton stiff-leg, with 35 ft. timber boom. A small Sullivan air compressor was used for the pneumatic rivetters. The superintendent for the steel erection was Mr. E. M. Huyck. The estimated cost of the building is $100,000. The architect is Alexander Pirie, of Calgary.

Interesting Law Suit

Prior to the erection of the above building, the owners conducted a suit against the abutting property which had no precedent in the province. The Alberta Loan & Investment Company, Limited, entered into a party-wall agreement with the owners of the hotel, and when the abutting building was constructed some two years ago, the architectural facade of the Loan Company's building was completed to the outside of the party wall. When the owners of the hotel now under construction, through their architect, desired to complete the design of the facade, it was essential for the terra cotta facing to come to the center line of the party wall. In the suit which followed, the court held that the defendants had encroached upon the party wall and allowed the plaintiffs to remove the brickwork in the facade of the abutting building to enable them to carry out the designs of their architect.

Canadian Stewart Company's Contracts

The Canadian Stewart Company, Limited, of Montreal and Chicago, have under construction an addition to the warehouse of the Canadian Consolidated Rubber Company, Limited, on Tenth Avenue West. The existing building has a frontage of 57 feet 11 inches, and the addition will have a frontage of 75 feet, making the building nearly 133 feet in front. It is 110 feet deep and will have five storeys and a basement. The exterior walls are of solid brick construction, on concrete foundations, the interior being of mill construction, with 2 x 6 laminated floors throughout. The roof will be covered with a 5-ply tar and gravel roofing. The estimated cost is $100,000.

The same contractors have commenced the foundations for an addition to the grain bins and malt house of the Canada Malting Company, Limited ,which will double the capacity of their present plant, built last year. The addition to the germinating house consists of further germinating compartments with the corresponding air attemperators, and will be 77 ft. wide, 120 ft. long, and 27 ft. high, of reinforced concrete construction with solid brick exterior walls. The additions to the elevator will exactly duplicate those erected before, and will consist of nests of circular tanks with conveyor house next the malt house. There will be a total of 35 tanks, having a capacity of 500,000 bushels. Ten of these will be 21 feet in diameter, with shells 7 inches thick, and twelve will be 13 feet 10 inches in diameter, with shells 6 inches thick, the other tanks being formed in the pockets between the circular tanks. All the tanks are 90 feet high above the foundations, and are charged by 30-inch belt conveyors running in the pent-house over the tanks and will be emptied by similar conveyors running in tunnels beneath.

Electric Trucks in Calgary

The city of Calgary recently purchased 7 electric trucks comprising one 5-ton, two 3-ton, two 1-ton, and two 1,000 gallon sprinklers and flushers. The complete outfit is shown in one of the accompanying photographs and the sprinklers are shown in action in the other picture. It is difficult to imagine a scene that would speak more forcibly of the rapid development of the West and their progressive attitude in all the phases of modern business life. We are indebted to Commissioner A. G. Graves, of Calgary, for the photos and the gratifying information that "electrics" are proving entirely satisfactory in meeting municipal requirements.

In regard to mileage, Commissioner Graves states that they make from 40 to 45 miles per day with the one-ton trucks, without boosting them at noon. The three-ton truck that is used in the Stores Department is doing very good work, so far as mileage is concerned. It has recently been hauling 6,090 lbs. of cement a distance of about 3½ miles. Nearly half of this distance is on paved streets, but after this there is a 11½ per cent. grade of about 1,500 ft. in length, which is still in an unimproved state. Beyond this there is about one mile of mud roads. They have been getting about 39 miles per day out of this particular truck, under the above mentioned conditions, without boosting when the roads were in a dry condition. On the other hand, when the roads are wet and slippery, it is necessary, to get the above mentioned mileage, to boost the batteries during the noon hour. So far they are getting splendid results, and the Commissioner has no doubt but that the operative costs will be well below the estimate which was compiled at the time of purchase.

Two storage sprinklers in operation at Calgary.

The new catalogue of the Heenan refuse destructor, manufactured by Messrs. Heenan & Froude of Canada, Limited, is illuminating as to the great strides that have been made in this important field. The wide range of application is shown conclusively by the excellent illustrations which adorn the catalogue. Heenan destructors are in use all over the world, while the fact that they have been successful in open competition at Ottawa, Westmount, Calgary, Moose Jaw and other cities attests their growing popularity in Canada. Copies of the catalogue in question may be obtained from the managers, Messrs. Laurie & Lamb, Board of Trade Building, Montreal.

Montreal Harbor Commissioners' Report

To use the words of the Montreal Harbor Commissioners, in the annual report just issued, 1912 was "a record year of constructional achievement." The report gives many details showing that the port did the largest business in its history, and that great progress is being made with the programme of improvements authorized by the government. "There has been achieved, with a measurable degree of success, the solution of one of the biggest problems which transportation presents, in the co-ordination of rail, river and road traffic, all meeting at a point of interchange, with possibilities of assembling cargo with economy and dispatch."

The harmonious and comprehensive scheme of port development that took three years of careful study to prepare, and which, before being adopted by the Commissioners, was subjected to an independent board of engineers, is now well on its way. When completed it will provide Canada with a national port containing ten miles of first-class harbor accommodation, combining close co-ordination of railway, river and roadway accessibility, with ample warehousing areas, thus ensuring the best obtainable transportation results upon a moderate capital investment.

During the year Elevator No. 2 was under construction. Since then it has been decided to add to No. 1 elevator and also to build a third elevator, the site of which has not yet been settled. The Commissioners' high level railway now extends nearly as far east as Dominion Park and will ultimately extend to the end of the Island. This system replaces the old low level railway that was only operated for seven months and furnishes access to the harbor from the city by means of subways instead of level crossings. This high level railway service furnishes Montreal with a railway terminal under neutral control and managed for the benefit of all railways and the public alike. This will ultimately lead to all the steamship sheds being used as freight distributing warehouses during the winter and place in the heart of the city a first-class freight emporium accessible to all railways, merchants and cartage companies for the assembling and distribution of freight economically. The system will ultimately furnish to all industrial concerns established near the water front an all-the-year-round railway service with every railway doing business with the port, and supply every manufacturing centre there established with continuous railway service throughout the year with all railways. This is in addition to deep water communication provided by the piers.

Mr. F. W. Cowie, M.I.C.E., the chief engineer, gives details of the engineering work of the year, including the new Victoria pier and market basin. In the construction of the quay walls several new features have been employed. The cribwork substructure is built with double face timbers and very great additional strength. The concrete wall of the superstructure is also built of additional strength, with new designs for the mooring of vessels. A new arrangement has been designed and successfully carried out in connection with the construction of the lower part of the concrete quay walls. Mass concrete deposited in water has always proved difficult of perfect construction, and when the face is imperfect in the vicinity of the low water, where the November frosts attack it, the wall, in a few wears, becomes eaten away and undermined. Footing blocks of concrete moulded in air have been used for some years. They are quite successful as regards giving a permanent concrete face in the vicinity of low water which is not attacked by frost. The blocks, however, do not fit themselves to the top of the wooden Canadian cribs in such a way as to give the degree of stability or such uniform bearing surface as is considered necessary where the heavy concrete retaining wall is founded on timber substructure.

Reinforced concrete shells of an absolutely new design were tried in 1911 and 1912 and proved fully successful. These shells are six inches thick, fully reinforced with steel rods, the surface glazed and hardened, and are made to fit the top of the cribwork. They are in sections about 20 ft. long and the full width of the bottom of the concrete wall.

A derrick lifts them from a scow and places them accurately in position, and when the interior is filled with concrete from the mixer it forms four feet of solid wall above the top timbers and gives a perfectly stable foundation for the wall, with even bearing surface so as not to strain any parts of the timber. When the top shell is reached the wall is above water and the wall is built as a direct wall in air with a perfect face.

It has been found that vertical quay walls are much more convenient for present day ships than walls having an angle, and the quay walls are now designed vertical. This requires careful design for stability, but when completed it obviates much of the danger of either the ship or the crib being damaged under water, as is the case in walls having a batter.

Several other important works were carried out, while a large amount of dredging was also done. Altogether $2,893,129 were spent on capital account.

Annual Convention R.A.I.C.

The annual convention of the Royal Architectural Institute of Canada was held in Calgary, September 15-16, under the presidency of Mr. J. H. G. Russell, of Winnipeg. Addresses of welcome were delivered at the opening session by Mayor Sinnott and others prominent in the civic life of Calgary. The annual report disclosed a most satisfactory year's work, with the institution in good financial standing. Interesting papers were delivered by Professor Brydone-Jack, of the Civil Engineering Department of the University of Manitoba, and by Mr. F. Goldie Engholm, of Vancouver. The delegates were entertained at a smoker given by members of the Calgary Builders' Exchange. The annual dinner of the Institute, which was a most successful function, was held at the Alexandra Hotel. The arrangements reflected the greatest credit upon the local organizers, Messrs. L. M. Gotch and G. M. Laing. Further details will be given in our next issue.

American Road Congress

Systematizing the purchase of all road materials and equipment through the establishment of purchasing departments, somewhat along the lines followed by great railroad corporations, is strongly advocated by Maj. Henry G. Shirley, Chief Engineer of the Maryland State Roads Commission, in a paper which he will present at the Third American Road Congress, which will be in session at Detroit, Mich., during the week of September 29. An intelligent selection of material and equipment, exact knowledge of values and prices and utilization of discounts and credits are among the advantages claimed for a centralized system for the purchase of road materials and equipment.

The construction and maintenance of concrete roads, a type which is attracting attention among road builders, will be explained in a paper by Mr. F. F. Rogers, State Highway Commissioner of Michigan, and the discussion on his paper will be opened by Mr. A. N. Johnson, State Highway Engineer of Illinois. A similar treatment will be given the subject of brick roads by Mr. J. M. McCleary, County Engineer of Cuyahoga County, of which Cleveland is the county seat and which has a large mileage of excellent brick roads, the discussion to be opened by Mr. R. Keith Compton, Chairman of the Paving Commission of Baltimore.

Tars, oils and asphalts in connection with the construction and maintenance of roads have been so generally used in the east as to bring out much valuable data. The basic paper on this subject will be presented by Mr. S. D. Foster, Chief Engineer of the Pennsylvania State Highway Department. The discussion will be opened by W. A. McLean, Chief Engineer of the Province of Ontario, Canada.

The lessons learned at the International Road Congress held recently in London will be presented at the big meeting in Detroit by Col. Wm. D. Sohier, Chairman of the Massachusetts State Highway Commission.

A paper which will attract attention will be presented by Mr. Austin B. Fletcher, State Highway Engineer of California, in which he will describe the successive steps in the building of California's great $18,000,000 state system of trunk lines.

The News in Brief—From Coast to Coast

Sewer contracts to the total value of $700,000 have been let recently by the Works Department of the city of Toronto.

According to a Winnipeg dispatch it is the intention to replace the present St. John's Cathedral by a new building estimated to cost $250,000.

The wages of the Montreal plasterers have been advanced 5c an hour to 55c, for an eight-hour day. The new scale started on September 1st.

The permits issued at Vancouver to the end of August, 1913, amounted in value to $8,433,942. The corresponding figures for 1912 were $11,151,702.

The Saskatchewan Government has been petitioned to set aside half a million dollars for building extensions to the provincial university of Saskatchewan.

New plans are to be prepared for the proposed Toronto Barracks. This will mean the postponement of the commencement of construction for at least seven or eight months.

A pipe-line 44 miles long to bring water into Calgary from the foot-hills of the Rocky Mountains is recommended by Mr. A. W. Ellson Fawkes, Waterworks Engineer of Calgary.

The building permits issued at Regina for the current year to the end of August represented a value of $3,201,050, as compared with $4,622,479 for the corresponding period of last year.

The 10th annual convention of the American Road Builders' Association will be held in Philadelphia, December 9-12. Mr. E. L. Powers, 150 Nassau street, New York, is the secretary.

The Canada Cement Company have in preparation plans for a new mill at Medicine Hat which will have a capacity of some 4,000 barrels. Three or four hundred men will be engaged at the outset.

The 20th annual meeting of the American Society of Municipal Improvements will be held in Wilmington, Del., October 7-10. The secretary is Mr. A. Prescott Folwell, 15 Union Square, New York.

The building permits issued at Prince Albert, Sask., from January 1 to August 31 amounted to $1,545,375. The August total was $201,000. The figures are supplied by Mr. H. L. Fitzsimmons, Building Inspector.

The Shea-MacVaugh Engineering & Construction Company, of 608 Couch Building, Portland, Oregon, has established a branch concern in British Columbia, with head office at 312 Jones Building, Victoria, B.C.

Last week the Winnipeg City Council passed a $13,000,000 by-law for the construction of a water system from Shoal Lake. Voting will take place on this by-law October 1. A by-law granting $275,000 to the Winnipeg General Hospital also passed.

Construction work on the Dominion Government public dock to be built on Burrard Inlet, Vancouver, is to be started within the next week. The Public Works Department awarded the contract for the project last week to Messrs. Henry, McFee & McDonald, at the sum of $1,250,000.

Lockwood, Greene & Company, architects and engineers for industrial plants, 60 Federal Street, Boston, announce the establishment of a Canadian office under the name of Lockwood, Greene & Company of Canada, Limited, with headquarters in the McGill Building, Montreal.

The Napanee Brick & Tile Company have completed the installation of a first-class plant at Napanee and are now commencing operations. The company will employ some 35 hands at the start. It is expected that about eight or ten million brick will be made next season.

Contracts for two government elevators at Saskatoon and Moose Jaw have been awarded to the Barnett-McQueen Company of Minneapolis. The contract price is slightly under a million dollars for each elevator. The successful tenders were some $300,000 lower than the next bidder.

Operation on what is reported to be the largest reinforced concrete bridge were commenced at Saskatoon last week when Dr. Murray, president of the Saskatchewan University, turned the first sod. The bridge will be 1600 feet long and 63 feet wide, having a 45-foot roadway. Mr. R. J. Lecky is the contractor.

Work has now commenced on the new 25th street bridge over the South Saskatchewan river. This will be the fifth bridge at this city. It will cost $400,000, and will take over a year to construct. Work will be rushed throughout the coming winter. The bridge will connect the university with the central portion of the city.

A United States syndicate is prepared to enter into negotiations with the Regina city council for the purpose of securing a franchise to install a gas plant, and will put up bonds to the extent of $500,000 if necessary, according to a statement made by Mr. C. E. McQuaid, at the monthly meeting of the Board of Trade last week.

The contract for the excavation of the Hudson's Bay Company's department store at Victoria has been awarded to Messrs. Luney Bros., of that city, and it is expected that the contract for the construction of the building itself will be made while the excavation is in progress. The project involves the expenditure of $450,000, exclusive of the site.

The Sault Dredging & Construction Company have been awarded the $90,000 contract for dredging the channel between Goat Island and Little Current on Manitoulin Island to a depth of 22 feet. The largest freighters on the lakes will then be able to dock at Little Current and it is probable that the dredging is but the first part of a big program of terminal facilities at that point.

Hon. Robert Rogers, Minister of Public Works, has been giving his attention to many plans for the improvement of the harbors of the Dominion now in progress or being considered. It is estimated that within the next few years the government will find it necessary to spend $100,000,000. These works to include dry docks at Victoria, Vancouver and Esquimalt and harbor improvements at Montreal, Toronto, St. John, Hamilton, Halifax, Fort William and Sault Ste. Marie.

City Engineer Rust, of Victoria, B.C., reported to council last week that it would cost $250,000 to extend the permanent pressure pipe line of the Sooke Lake water works [illegible] its present terminus on the Gorge Road to a point near Parson's Bridge, so that a permanent connection could be made with the system of the Esquimalt Waterworks Company. Once the connection was made, however, the company would be in a position to provide the city with 10,000,000 gallons daily.

Tenders will be called shortly for the new Transcontinental shops to be erected at Quebec. Representatives of a number of big contracting firms are in the city figuring on the specifications. The works will cost in the neighborhood of two million dollars and it is the intention to erect the most modern and up-to-date shops. Among the firms which are figuring on the work are, Peter Lyall & Company, of Montreal, and Quinlan & Robertson, of Winnipeg. The latter firm recently built the big shops of the Transcontinental at Winnipeg.

The Ontario National Brick Company is now manufacturing over 200,000 bricks a day. Not all of this output is being shipped as made, but a good proportion is being delivered and sales are quite satisfactory. The Ontario National Brick Company was organized a few months ago with a capitalization of $2,000,000 common stock and $1,250,000 bonds issued. The president is J. N. Greenshields, K.C., of Montreal. The plant has been operating since about June 1st, and already is turning out two-thirds of its maximum output of 300,000 tons a day.

A despatch from Ottawa states that plans and specifications have been submitted by the Harbor Commission of Montreal to the Marine Department for two new freight sheds at sections 24 and 25 of Montreal harbor, at a cost of $300,000. Shed number 24 is to be 275 feet long and 106 feet wide and two storeys high, and shed No. 25 485 ft. long and 112 ft. wide and also two storeys high. The foundation will cost $100,000 and will be laid this year, while the general construction will take place in the early spring and will be available for business next navigation season.

Extensions to the development plant of the Kaministiquia Power Company are pending, but no definite decision has as yet been announced nor any tenders called nor contracts let. The nature and extent of these additions will depend somewhat on trade conditions and business prospects of the next few months. The present installed generating capacity has a nominal rating of 15,000 h.p. with overload rating of 22,000 h.p. The hydraulic development, including dams, intakes, forebay, etc., was originally installed for an ultimate capacity of 35,000 to 50,000 horse power.

The largest flour milling industry in the British Empire is claimed to have been organized at Calgary where a crowd of United States capitalists have formed a company know as Calgary Flour Mills, Limited, for the purpose of carrying on an extensive milling and elevator business in the city. A 15-acre site has been secured and a flour mill having a capacity of 6,000 barrels daily, together with a large terminal elevator, will be erected at an initial cost of $1,400,000. The promoters of the company include Senators Healy and Knapp, and Alexander Ingraham, of Minneapolis, who will become managing director.

The collapse of a wall, carelessly built 50 years ago, was the cause of the disaster at the J. C. Turnbull departmental store, Peterborough, on August 28 last, according to William Langford who inspected the building on behalf of the Trusts and Loan Company while alterations to connect it with the adjoining Barrie store were in progress. His view was concurred in by W. J. Johnston, the contractor in charge of the alterations who examined the building after the accident and found that a weak wall had collapsed. Mr. Langford testified that the biggest opening in the wall without a support was 19 feet wide, that the beams rested on an 18-inch wall and were amply strong enough to carry the weight. There was no doubt that the wall, which was built 50 years ago and did not appear to be carefully built in the centre, gave way and caused the outer walls to bulge and the floors to fall in.

According to a dispatch from Victoria, an extensive programme of bridge construction is about to be inaugurated on the Esquimalt & Nanaimo Railway Company's line. Last week a large shipment of steel, to be used in this connection, was received from the Canadian Bridge Company. The work of most interest is the erection of a fine steel viaduct over Arbutus canyon, one of the specially attractive points, scenically, between Victoria and Duncan. The concrete piers for it have been ready for some months, and now that the superstructure is at hand, it will not be long before the trains are using it in traversing the ravine.

Canadian Railroad Development

The C. P. R. bridge over the St. Lawrence at Lachine is nearing completion. The work of the railway has not been suspended a single moment during its double-tracking. The total expenditure will amount to $3,000,000.

According to Mr. A. W. Smithers, chairman of the Grand Trunk Pacific, the line will be completed next year. He stated in Montreal that there will be no let up on building operations while there is a mile of steel to lay or a fraction of a dump to construct between the eastern and western terminals of the railway.

Most important of the legislation to be taken up at the session of the Alberta Legislature will be the building by the Provincial Government of the Alberta and Great Waterways Railroad from Edmonton to Fort McMurray, 230 miles, from which point the Athabasca, the Great Slave and the Mackenzie Rivers are navigable to Fort McPherson, 2,100 miles.

Engineer Carleton of the Grand Trunk Pacific, announces that that road will undertake the construction of a line through Moose Jaw, Medicine Hat, and through the Crow's Nest country into Southern British Columbia. The Calgary-Edmonton line will be extended south to make connections with the proposed line, work on which will be commenced in the spring.

Mr. F. Somerville has submitted a report on the railway situation in Hamilton with a view to the concentration of the existing railways and the proposed C. N. R. railway at a union station to be situated near the cross of the G. T. R. tracks. Mr. Somerville advocates six main lines and recommends the widening of Stuart Street cut at a cost of $50,000. The report has been sent on to the city council.

Three miles of steel a day are being laid by the Canadian Northern Ontario Railway on its Sudbury-Port Arthur line in an endeavor to complete this section, which is to connect the eastern and western Canada systems, by the end of the present year. According to official figures, there are only 180 miles to be finished. Grading is in shape sufficiently far ahead to allow of steady track-laying, the bridges are up, and there seems little doubt that the rails will be connected up in 1913. This is in accord with the announcement that the company would be operating freight trains to western Canada in the early months of winter.

The Canadian Northern Railway has decided to make four divisional points on the Sudbury to Port Arthur section of their new transcontinental line. They will be located at Capreol, Foley, Fitzbach, and Hector. All points will have round-houses, yards, and repair shops. The latest report shows that there are yet 180 miles of steel to be laid. At present the contractors are making a new record by laying three miles of steel per day, and it is probable that it will be fully completed within the next two months. The grading is now so far advanced that it will not interfere with the track-laying. The bridges are all completed, and the ballasting is being rushed.

Tenders have been put in for constructing the North Railway from Montreal to the Transcontinental at Bell River, and a decision will be made in October. Five parties, consisting of a hundred men, have been in the field for the past five or six months. Some 150 miles of the line from a point 25 miles beyond the Gatineau to Bell River will be practically over a comparatively level country and little or no difficulty in the construction of the road will be experienced. On the upper part of the North Railway little construction work will be done this winter, although camps will be established so as to ensure active operations on the opening of spring. In the Laurentide a good deal of the work can be done quite as well this winter as in summer so here operations will go ahead rapidly.

In order to facilitate the driving of the 22 x 30-foot double track C. P. R. tunnel, over five miles long, through Rogers Pass at the summit of the Selkirks, Messrs. Foley, Welch & Stewart, contractors, have decided to adopt a new method which will be watched with interest by the engineering world. The expedient consists of the boring of a parallel tunnel, seven feet by eight, for virtually the same length and from this tunnel crosscuts will be made at short intervals to the site of the proposed tunnel and enable gangs of men and machine drills to attack the work simultaneously at scores of points. Incidentally the "pioneer" tunnel, as it has been called, will also provide ventilation. The proposed tunnel, for the greater portion of its length, will be driven through with a bore, probably not much larger than the pioneer tunnel; later, in addition to the boring from either approach, machinery will be installed at various points and the working enlarged to the standard size provided in the contract. Steam shovels are now busy grading the half-mile approach through soft earth to the site of the western portal of the tunnel below Glacier station. From near the proposed entrance will also be started the parallel "Pioneer" to provide easy access to the site of the big tunnel; and at the east side of the mountain but some distance from the future east end of the permanent tunnel, a start is being made on the other end of the pioneer tunnel. The latter working, being driven at an angle, will be driven westward into the mountain about 2,000 feet before a crosscut will be made to the ground to be traversed by the permanent tunnel.

Personal Mention

Mr. W. C. Willard has secured an appointment on the staff of McGill University, succeeding Professor Smart as lecturer on railway engineering.

Mr. Isham Randolph, consulting engineer, of Chicago, has taken a new suite of offices in the Commercial National Building, to which address communications should be sent.

Mr. Hilder Daw, A.M.C.S.C.E., Montreal, has been retained by the Corporation of Sherbrooke, P.Q., to revise the drainage and purification system to meet the growth in the city's population.

Mr. A. M. Wright, the representative of E. F. Giberson & Company, Limited, New Birks Building, Montreal, New York, and Bedford, Indiana, is on a trip to the West, in the interests of the firm, who are owners of big limestone quarries at Bedford, and whose product is known as "Real Bedford."

New Head of Canadian British Insulated

Mr. A. E. Grant

Mr. A. E. Grant has succeeded his brother, Mr. Lawford Grant, as managing director of the Canadian British Insulated Company, Ltd., Power Building, Montreal. Mr. A. E. Grant has had a wide experience as a marine, mechanical and electrical engineer, and has supervised some extensive contracts. His first position as an electrical engineer was with the Notting Hill (London, Eng.) Electric Light Company, for whom he erected some three-phase machinery, the second of its kind used in the British Isles. Subsequently he joined the engineering staff of the British Insulated and Helsby Cables, Limited, England, which has a large interest in the Canadian British Insulated Company. During his 14 years' connection with the British Company, Mr. A. E. Grant had charge of some important work, including the complete equipment of the Chesterfield tramways, and also the laying of extra high tension mains of the Metropolitan tramways. In 1906 he was appointed manager and chief engineer of the Cardiff office, which takes care of the company's business in South Wales and the south-west district of England. He comes direct from Cardiff to Montreal, and has now taken over the duties of Mr. Lawford Grant, who resigned to accept an important position with the Eugene F. Phillips Electrical Works, Limited, Montreal.

The Maritime Bridge Company, Limited

The William P. McNeil Company, Limited, of New Glasgow, announce a change of name of their firm. Hereafter the company will be known as The Maritime Bridge Company, Limited. This change marks an additional step in development and inaugurates a movement to keep in advance of the continued increase in the structural business of the Maritime Provinces.

The William P. McNeil Company, Limited, was incorporated in 1908. A good market for the product of the company was developed under the capable management of the McNeil brothers, and the business grew until, in the spring of 1912, it was deemed advisable to place the plant and business in the most advantageous position possible for the handling of its requirements. As a result of this decision the control of the company was purchased jointly by The Canadian Bridge Company of Walkerville, Ont., and The Dominion Bridge Company, Limited, of Montreal.

Following this change of control, Mr. Walter McNeil retained his interest and the presidency of the corporation, while Mr. K. W. Bash, of The Canadian Bridge Company, Limited, went to New Glasgow to take up the work of plant revision. A new office system was introduced, the working capital was increased, and in the fall of 1912 the shop was thoroughly overhauled. The growth of the business in the eastern provinces and the development of the plant under the impetus of the changes made, led the directors to recommend to the stockholders, at their recent annual meeting, the present movement, as one of great advantage.

The executive and directorate of The Maritime Bridge Company, Limited, is as follows:—Executive: Mr. Walter McNeil, president; Mr. Kenower W. Bash, vice-president and manager; Mr. Robert C. Grant, secretary. Directors: Mr. Francis C. McMath, President Canadian Bridge Company, Limited; Mr. Phelps Johnson, President Dominion Bridge

Company, Limited; Mr. Charles T. Miller, Secretary Canadian Bridge Company, Limited; Mr. G. H. Duggan, General Manager Dominion Bridge Company, Limited.

The shop is under the capable management of Mr. R. A. Stewart and has a largely increased capacity, with plans for further extension in view. A new steel and reinforced concrete office building, of two storeys and a basement, is now in the course of erection at the plant site. This structure replaces the former building burned in the fire of last December. A far larger tonnage of structural steel shapes, plates and bars is carried in stock, ensuring prompt delivery of work to customers. Printed monthly stock lists are issued to the trade.

It is the intention of the management to keep pace with the growth of the eastern provinces and to supply their customers with the best quality of work.

Decorative Sandstone in British Columbia

The Denman Island Stone Quarries described for this Journal by Mr. L. G. Robinson, Consulting Engineer, Vancouver.

It is said that the mineral products of British Columbia are practically unlimited in extent and variety. In the cities of the east it is quite common to send away hundreds of miles for decorative sandstone, but British Columbia is specially fortunate in the vicinity of Vancouver in having a supply of excellent quality of sandstone near at hand.

The Denman Island Stone Quarries are located on the Denman Island about seventy-five miles from Vancouver in the Gulf of Georgia. The formation of the island is such as to indicate that the whole structure has been built up by deposits of material under water at great depth, and nature has been kind enough to shove up a portion of the earth's crust at this point and expose to view great quantities of the most homogeneous building stone to be had.

Unloading sandstone blocks at the Vancouver market.

The face of the quarry is exposed by reason of a fault or crack in the stratified rocks where the rock on one side of the fault or crack has been shoved upward a distance of seven hundred feet or more than it was on the other side. The face of the quarry is not, however, seven hundred feet high, but has been scrubbed and scoured since the glacial period until the present with the result that the face of the quarry stands only about one hundred and twenty feet above the level of the surrounding country.

The earth's movement which brought about this exposure must have been very gradual and even, for there appear to be very few seams in the stratified rock and those which do appear are practically at right angles with the face of the cliff. These seams and the lines of stratification are such as to render the rock available in most advantageous shapes and sizes. The strata lie upon a plain which dips about ten degrees away from the face of the quarry and at right angles to it. There is no danger, therefore, of the rock falling into the workings when being quarried.

This quarry has been in operation since 1908, Vancouver being the principal market. It has been found that the more the workings are extended the better the condition of the rock is to be found. Ten layers of this stone have been opened up and it is found that they vary in thickness from four feet to fifteen feet, but the quality of the stone remains the same in all. The color is a bluish-gray and does not change greatly after long time exposure to the elements. This feature alone is enough to recommend it to architects, for the reason that the appearance of a structure faced with this sandstone is likely to remain permanent for a long period of years.

The manner of working the sandstone depends largely on the character of the demand. The greatest demand appears to be for the stones in the shape of slabs for the purpose of veneering lintels, sills and copings. Ordinarily the stone is hewn out of the quarry by channelling machines into blocks measuring four feet square and twelve feet long. These are placed on carriages by means of huge derricks and wheeled into place under the gang-saw and there sawn into slabs of a thickness from four inches to eight inches. These slabs are then laid upon railway cars and transported to the dock, about a half mile distant, where they are laid upon scows or directly into ships to be transported to the market. They are then unloaded at the destination and cut into smaller forms suitable to the purpose for which they are desired.

Modern fireproof structures are made up of steel and concrete, but the external appearance of a concrete building is ordinarily not desirable and so the facing of brick, stone or tile is put on to give the building a better appearance and more stability. Sandstone lends itself to this use most readily, in that it may be easily carved or cut to the shapes desired, and ornamentation with this material is not difficult to acquire.

If the demand for this stone should continue to increase as rapidly as the history of the quarry would indicate, then it would be a matter of only a few years when the whole face of the quarry would have to be worked at the same time. Even then, the output would be increased by working the quarry in two levels so as to develop the working face twice the length of the cliff, or forty-six hundred feet.

New Concrete Industry

A plant for the manufacture of concrete sewer pipes and other concrete products is being constructed at St. Francois de Sales, 18 miles from Montreal, by the Montreal Concrete Works Company, Limited, 225 St. James street, Montreal. The estimated output will be 25 cubic yards daily and this will be increased as circumstances warrant. At the present time large quantities of pipe come from England and the United States, due to the fact that this industry is still in its infancy in this country and is yet to be developed. The company intend to manufacture sewer pipe by the slush process and reinforced by the best Clinton welded wire. Within the next three months it is expected that all sizes of pipes will be ready for the market, both in the oval and round.

The company are also dealers in cut, crushed, one-man and dimension stone, and own 20 acres of quarry land at St. Francois de Sales. A special switch line connects the plant with the main line of the C. P. R. The stone used in the construction of the C. P. R. Windsor Station, Chateau Frontenac and piers for the new C. P. R. bridge at Lachine was quarried from this property.

The capital of the company is $99,000. The officers are E. Lavigne, president; F. A. Sylvestre, manager director; Ed. de Jong, treasurer, and W. Allen Walsh, secretary.

Electric Trucks in Contracting Work

Thousands of tons of coal and general building supplies have been delivered during the past three years in Detroit by three 5-ton electric trucks installed by the Electric Truck Company of Detroit and made by the General Vehicle Company, Inc. These three huge trucks, with traveling cranes, have attracted much attention on Detroit streets, where they have been seen daily and practically without interruption year after year, during warm and cold weather and on rainy days and on days when the snow was so deep that it prevented street cars from maintaining their schedule.

It is stated by the J. A. Mercier Company that these trucks have hauled on an average of slightly above 40 tons of coal and have traveled an average of 48 miles daily for years. It is the custom of the truck drivers to boost the batteries at noon. Under these conditions 48 miles are covered each day, but where the batteries are changed at noon the trucks will carry as high as 50 tons per day and will travel over 60 miles.

This is stated to be two and one-half times the amount of work that was accomplished by horses in the old days, and the Mercier company cannot see how it could have attended to the added work which has come to it within the last three years without the motor trucks. The work performed by these trucks during most of the day is the hauling of coal to the plants of the Central Heating Company, and a full 5-ton load is taken each time. The body is lifted clear of the truck with its load, dumped, and replaced, thus saving much time.

Another important installation is that of the A. A. Albrecht Company, whose offices in Detroit are in the Penobscot Building. This company employs constantly one truck of 2½ tons capacity and another of 3½ tons. The company has had the 2½-ton truck in use constantly for 3½ years, and the 3½-ton truck in use for one year. These trucks cover 35 to 40 miles a day, and are employed in carrying building material for use in the various business ventures of the company, which is one of the largest builders in Detroit.

Mr. Albrecht says "I cannot say too much for the work of my trucks. They are running all of the time. All we have to do is to keep them charged and they are constantly on the run. I have yet to see the time when there was an opportunity to 'knock' this installation, which has been a godsend to us. I presume that were we to install horse-drawn wagons for this labor our expense would be increased to at least three times what it is at present.

"The cost of taking care of our increased business during the past several years with horses would have been practically prohibitive, and would have cost us a fortune. The trucks entered our business when they were most needed, and horse-drawn wagons rapidly became obsolete with us. The total increased demand upon the delivery facilities in our business and its numerous branches was entirely taken care of by our power wagon equipment. The trucks have been in the repair shop but very little, and in fact I know of no serious complaint. We have often-times carried great over-loads without any trouble whatsoever. I believe that our general satisfaction has been due to the electric trucks, although I am informed to-day that since we secured these trucks, gasoline-driven vehicles have improved greatly. We use former teamsters, who have been educated in the operation of the trucks.

"Our men look very carefully after their trucks at all times and are very proud of their work. Upon returning from their day's work, the truck is placed in its regular location, the battery is taken away and charged, and the men arrive in the morning regularly in plenty of time to replace the batteries and to start their day's work. Each of the trucks receives a yearly overhauling."

In the yearly overhauling of the trucks, every part receives careful examination, and all parts needing renewal are replaced. It is noteworthy that there have been few replacements during the time the Albrecht company has owned these trucks.

As regards speed, with full loads of tile, lumber and cement, the trucks had at times covered easily six miles per hour. With five tons, the 3½-ton truck has covered six miles easily, although the regulation speed of the truck is but seven miles. The electric vehicle has proven a splendid puller.

Mr. Albrecht believes that the economy of the electric truck over the gasoline truck for short hauls is in the neighborhood of fifty per cent. at least, and in his enthusiasm he stated that the beauty of the trucks he had, laid in the ease of operation and in the fact that the trucks were working all of the time.

The Largest Gas Engine

The Ford Automobile Company are installing what is probably the largest gas engine in the world, at their works in Detroit. There are four double acting cylinders 42-in. x 72-in., two in tandem upon each side, held together with four 6-in. tie-bolts. The engine is designed to run at 85 r.p.m. or 1020 ft. of piston speed. The length of the engine from the front of the pillow block to the end of the tail-rod extension is 73 feet and its over all width is 32 feet. The crankshaft is 32 inches in diameter and 25 feet long and carries an 80-ton fly wheel and the armature of a 2,500 kw. generator. The generator is capable of carrying a 25 per cent. overload and the engine is rated at 5,000 h.p.

The Conservation of Our Water Powers

The Commission of Conservation have just issued their fourth annual report on the progress of investigation into the natural resources of our Dominion. The report includes contributions by Mr. Leo. G. Denis and Mr. Arthur V. White concerning work done by them in connection with the collection of water power data at different points in Canada. These latter reports are written in the form of a condensed diary which makes almost as interesting reading as the logbooks of Stanley, Nansen, Shackleton, Scott, and other explorers of unknown regions. The only difficulty is that the information is as yet too meagre. There is enough, however, to indicate that the work of these engineers is along lines which are certain to give, ultimately, valuable and far-reaching results, showing that the Commission have been well advised in the type of work they are undertaking. That the results will come slowly is only to be expected, as the field of investigation is large, the work is onerous, and the funds available are not unlimited. Apparently however, the government is prepared to deal fairly liberally in the latter respect, a course with which we entirely agree, for, quite aside from the immediate monetary value of accurate knowledge about our water powers, the definite assurance of their actual magnitude will give our Dominion a considerable added prestige among the other nations of the world.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Waterworks, Sewerage and Roadways

Brampton, Ont.

Extension to waterworks system contemplated. Clerk, W. H. McFadden. By-law passed by Council to raise $16,000 by issue of debenture.

Twp. of Dunham, Que.

Municipal Council of the Twp. has appointed councillors G. M. Beach and W. F. Lee and Mayor to purchase a 12-ton gasoline road roller. Mayor, E. E. Hall, Dunham.

East London, Ont.

Sewers, cost $40,000, to new factory district planned. By-law will be submitted October 1st. Mayor, C. M. R. Graham. Engineer-in-charge, W. N. Ashplant.

Hamilton, Ont.

Asphalt pavement, cost $6,472, McNab, Vine and John Sts., planned by City Council. Clerk, S. H. Kent. Engineer, A. F. Macallum.

Montreal, Que.

Sewer, Mt. Royal Heights, for City Realty Investment Co., Ltd., 41 Mayor St. Engineer, Thos. Iverson, 10 Cathcart St. Plans being prepared for laying out 9 miles brick or concrete pipes.

Ottawa, Ont.

City Council plans subway, drainage, etc., cost $14,000, on Bank street. Repave the street with stone blocks, new sidewalks, drainage, gullies, etc. Debenture to be raised. Mayor, J. A. Ellis, City Engineer, Archibald Currie.

Regina, Sask.

Irrigation system contemplated. City Council have applied to Commissioner of Irrigation, H. A. Thornton, for right to divert from Boggy Creek and Beaver Creek.

Sherbrooke, Que.

Drainage system contemplated by City Council. Sec., F. J. Griffith, Wellington St. Mr. Hilder Daw, C.E., Kings Hall Bldg., St. Catherine W., Montreal, will revise present plans and design a drainage and purification system to meet requirements of city.

St. Catharines, Ont.

Water services, cost $4,450, contemplated by City Council (Water Comsn.), for the Clay Products & Flax companies. Full information from H. K. Woodruff,

Toronto, Ont.

Grading, Indian Road, planned by H. A. Goldblatt, c/o Equitable Securities of Canada, Ltd., Traders Bank Bldg. About 25,000 cubic yards to be moved. Tenders called.

Pavements recommended by Board of Control. Tenders received by Mayor H. C. Hocken until September 23rd. Asphalt on Gerrard, Gough, Russett, Sorauren and St. Nicholas. Brick block on Sorauren and Sterling. Bitulithic on Williamson Rd. and Wineva ave. Concrete on two lanes. Rocmac macadam on east side of Humber River and Bloor street west.

Sewers recommended by Board of Control. Tenders received by Mayor H. C. Hocken until September 34rd. Danforth ave. storm overflow Sec. No. 1. Earlscourt drainage system No. 3. Wilton ave. storm overflow Sec. No. 3. Dufferin, Beaver, Brandon, Elmer, Ashdale, Bloor, Morrison and number of lanes.

Concrete walks and curbings. Tenders received by Mayor H. C. Hocken until September 23rd. Curbings on Sorauren, Gerrard, Sterling and St. Nicholas. Walks on Aldergrove, Avondale, Beech, Chandos, Danvers, Davenport, Duncan, Edith, Essex, River and West Lodge.

Extension to water mains planned by Town Council of Weston. Clerk, Mr. Taylor. The Water, Power & Light Commission will have plans prepared for extensions on Holley, Maria, Joseph and Hillcrest Road.

Walkerville, Ont.

Pavements and sewers planned by Town Council. Tenders received by Clerk, H. Robinson, until September 23, for (1) pavement in alley; (2) re-paving various street; (3) extension of sewers. Plans at office of engineer, Owen McKay, C.E. Mayor, R. H. Revell.

Paving, cost $8,123, Victoria Rd. from Wyandotte to Assumption, Walker Rd. from Ontario to Ottawa St. By-law passed. Mayor, R. H. Revell.

Winnipeg, Man.

Water system, cost $13,000,000, planned by Board of Control. Engineer, H. N. Ruttan, 223 James Ave. Concrete aqueduct, 85 miles, steel pipe 10 miles, from Shoal Lake, concrete reservoir at Transcona to have a capacity of 250,000,000 gals. Report furnished by experts has been adopted. By-law to be submitted to ratepayers Oct. 1st.

CONTRACTS AWARDED

Brantford, Ont.

Paving, cost $8,000, Brant ave. City Engineer, T. Harry Jones. General contractors, Warren Bituminous Paving Co. of Ontario Ltd., 103 Bay street, Toronto. Re-surfacing old pavement with asphaltic concrete, 6,400 sq. yds.

One and a half miles cement walks Echo Place, planned by Township Council. Clerk, James A. Smith. General contractors, Royal Artificial Stone Paving Co., Guelph. 12½c. sq. ft.

Hull, Que.

Asphalt pavement, Champlain Ave., planned. Mayor, Dupuis. Engineer, J. A. Laforest, City Engineer. General contractors, Ottawa Constr. Co., Central Chambers, Ottawa.

Lasalle, Que.

Sewers, near Lachine. Sec.-Treas., J. S. Ashby, 15 19th Ave., Lachine. Engineer, V. H. Dupont, 225 St. James St., Montreal. General contractor, Michele Lombardi, 243 Westminster Ave., Montreal W. Pipe, Stinson Reeb, E. T. Bank Bldg. Montreal.

Macleod, Alta.

Sewage disposal planned by Town Council. Engineer-in-charge, G. H. Altham. Work being done by day labor.

Peterboro, Ont.

Pavements, George, Charlotte and Hunter Sts., planned by City Council. Chairman Board of Works, William Buller. Engineer, R. H. Parsons. General contractors, Foley & Gleeson, Ottawa. Asphaltic concrete and paving blocks, $62,745.37.

Winnipeg, Man.

Asphalt pavement on lanes between Main and King, and Market and James, recommended by Board of Control. Secretary, M. Peterson. General contractor, J. W. Astley, Engineer of Construction.

Concrete pavement planned by Board of Control. Secretary, M. Peterson. General contractor, J. W. Astley, Engineer of Construction.

Railroads, Bridges and Wharves

Edmonton, Alta.

Railway planned by Alberta & Great Waterways Railroad. Edmonton to Fort McMurray, 230 miles. Matter to be taken up by Alberta Legislature.

Montreal, Que.

Dock work contemplated by the Board of Commrs. Sec., L. N. Senecal. Board of Control recommends that $1,500 be spent to get expert opinion on establishing New Ferry system including docks to St. Helen's Island.

Regina, Sask.

Bridge, cost $5,000, Elphenstove St., over Wascana Creek at Elephenstove St., planned by City Council. Engineer, F. McArthur.

Roy's Beach, B.C.

Wharf planned by Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Dist. Engineer, C. C. Worsfold, New Westminster, and J. S. McLachlan, Victoria. Specifications at offices of Dist. Engineers, Postmaster, Roy's Beach, and Dept., Ottawa. Tenders received by Secretary till Oct. 9th.

Steelton, Ont.

Town Council has signed agreement for street railway system with the International Transit Co. of Sault Ste. Marie, Ont.

Thamesford, Ont.

Dam, cost $7,000, contemplated for Cawthorpe Milling Co. Engineer-in-charge, F. W. Farncombe, Edge Block, London. Reinforced concrete construction, 150 ft. wide, 5,000 cu. yds. cement. Surveys have been made.

CONTRACTS AWARDED

Bayfield, Ont.
Repairs to pier, cost $3,200. Clerk, H. W. Erwin. General contractor, S. Moore. Wood and stone construction.

Brantford, Ont.
Elevating bridge for Lake Erie and Northern Rly. Co. General contractors, Wright, Hazzard & Cohen, Buffalo, N.Y. Raising Lorne bridge several feet and building concrete wall below Jubilee Theatre, etc. Work to start at once.

Dundas, Ont.
Bridge, cost $4,500, Ogilvie. Engineer-in-charge, P. H. Latham, c/o Toronto, Hamilton & Buffalo Rly., Hamilton. General contractors, The Hyland Constr. Co., Belleville. Clerk, J. S. Fry.

New Hamburg, Ont.
Bridge for County of Waterloo. Engineers, Bowman & Connor, 36 Toronto St. General contractors, Pipe & Clements, Berlin. 35 ft. concrete bridge at Hawkesville, Ont.

Prov. of Ontario
Railway stations, etc., cost $12,000,000, for C. P. R., head office Montreal, Que. General contractors, mason, carpenter, steel, plastering and painting, Jno. S. Metcalfe Co., 54 St. Frs. Xavier, Montreal. Roofing tenders for several stations received by General Contractors in about a week. Heating, plumbing and electrical tenders will be received by General Contractors later. Indiana limestone for 7 stations supplied by E. F. Giberson, 701 New Birks Bldg., Montreal.

Rainy River, Ont.
Dredging planned by Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractor, J. T. Horne, Room 18, Graham and Horne Block, Victoria Ave., Ft. William.

Stratford, Ont.
Bridge, cost $2,400, Romeo. Mayor, C. N. Greenwood. City Engineer, A. B. Manson. Chairman Board of Works, Ald. Pauli. General contractors, Stratford Bridge & Iron Works. Steel, 60 ft. span, 14 ft. wide, concrete abutments. Abutments in.

Sutton, Ont.
Bridge for Twp. of North Gwillimbury. Engineers, Bowman & Connor, 36 Toronto St., Toronto. Retaining wall, Lewis Constr. Co., Toronto. Steel span, Corbett Foundry Co., Owen Sound. 82 ft. 6 in. steel bridge, concrete abutments.

Trenton, Ont.
Canal, cost $130,278, planned by Dom. Govt. Dept. of Railways and Canals. Sec., L. K. Jones, Ottawa. General contractors, York Constr. Co., Ltd., Traders Bank Bldg., Toronto. Contract for Port Severn section.

Public Buildings, Churches, Schools, etc.

Baie Des Febvres, Que. (Yamaska Co.)
College for R. C. School Commrs. Sec.-Treas., N. U. Frechette. Tenders were received by Architect, A. Trudel, 15 St. Philippe St., Montreal. Four stys., 64 x 82, cement foundation, brick construction, felt and gravel roofing, iron stairs, seating, fire escapes, ventilating system.

Blenheim Twp., Ont.
Addition to school, cost $4,000, for School Sec. No. 24. Twp. Clerk, Hugh Allan, Drumbo. Architect, C. H. Beckman, New Dundee. By-law passed by Council. Plans in progress.

Canora, Sask.
School, cost $30,000, contemplated for Canora School District No. 1152. Treasurer, H. M. Sutherland. Four room, brick construction.

Chapleau Twp., Ont.
Completing public library, cost $10,000, contemplated. Clerk, T. J. Godfrey, Chapleau, Ont. Ratepayers will vote on by-law Sept. 15th.

D'Arcy, Sask.
School, cost $6,500, contemplated for D'Arcy School District No. 3016. Treasurer, D. N. Bontain. Plans will be prepared.

Montreal, Que.
Public lavatories planned by Board of Commrs. Sec., L. N. Senecal. Architect, E. J. Courval, Drawing Office, City Hall. City Commrs. will call tenders. Presto heaters.

Council has authorized plans to be prepared for new roof for market place at Lachine. Sec.-Treas., Hector Charette.

Alterations to St. Louis bath, Ontario St., planned by Board of Commrs. Sec., L. N. Senecal. Architect, Dalbe Viau, 76 St. Gabriel. Tenders will be called in about 10 days by Sec. Concrete foundation, stone and brick construction, felt and gravel roofing, marble, plate and wire glass, galvanized iron, architectural iron railings, boilers.

Alterations to public market, cost $15,000, Wolfe, planned by Board of Commissioners. Sec., L. N. Senecal. Architect, Mr. Chausse, City Hall. Tenders received by Board of Control. New concrete floor for market, 500 x 72.

Newmarket, Ont.
Home building planned by York County Industrial Home Commissioners. Tenders received by J. G. Cornell, Scarboro P. O., until Sept. 22nd. Plans, etc., with above, also J. S. McNair, Elgin Mills, County Clerk's Office, Adelaide St. E., Toronto, and the Home, Newmarket. Bulk tenders preferred. Extended time.

Newport, B.C.
Jail contemplated by Dom. Govt. Dept. of Public Works. Tenders received by Engineer, J. E. Griffiths, till Sept. 26th. Plans, specifications, etc., at offices of Mahoney, Govt. Agent, Vancouver, The Prov. Constable, Newport, or at the Dept., Victoria.

Ottawa, Ont.
City Council recommend the expenditure of $20,000 in putting up and equipping prison farm. Mayor, J. A. Ellis.

Church, cost $6,000 or $7,000, Lyon, for St. Peters Evangelical Lutheran, c/o Pastor, 250 Lyon St. Architect, c/o Pastor. Tenders will be received until Sept. 18th. Brick veneer construction, concrete foundation.

Regina, Sask.
Church contemplated in Eastern Annex, for Presbyterian Congregation. Pastor, Rev. Murdock MacKinnon, 1839 Lorne St. Plans will be prepared.

Saskatoon, Sask.
It is the intention of the Governors of Emmanuel College to double size of College next year. Plans will be prepared.

Smithville, Ont.
Heating and ventilating system for High School contemplated by School Board Trustees. Estimates required for hot air, steam and hot water heating. Building 2 storeys, 4 rooms, brick, plastered, stone basement, concrete floor.

Toronto, Ont.
The Exhibition Association contemplate building new machinery hall, sheep pens, dog building, poultry building, judging arena. President, J. G. Kent. Manager, Dr. J. O. Orr.

Theatre, cost $6,000, 1137 Yonge St., planned for Teck Amusement Co., 1137 Yonge St. Architect, N. G. Beggs, 12 Cosgrave Bldg. Tenders received by Owner. Two storeys, 26 x 40, brick and steel construction, brick foundation, felt and gravel roofing.

Church, cor. Fulton and Carlaw Ave., contemplated for Roman Catholic Denomination. Site purchased, 178 x 200. New parish formed. Parish priest not yet appointed. Further information from Archbishop McNeil, Wellesley Place.

Walkerville, Ont.
Incinerator contemplated by Town Council. Mayor, R. H. Revell. By-law passed Sept. 6th, cost $16,234.

CONTRACTS AWARDED

Belleville, Ont.
Dormitory building planned by Prov. Govt. Dept. of Public Works. Sec., H. F. McNaughton, Parliament Bldgs., Toronto. General contractors, Thos. Manley & Son.

Brockville, Ont.
Nurses home, cost $65,000, for Ontario Govt., Toronto. Sec., H. F. McNaughton, Parliament Bldgs., Toronto. General contractor, W. P. Driscoll Two and three storeys.

Hamilton, Ont.
Repairs to House of Refuge. Mayor, C. M. R. Graham. General contractor, George E. Mills, 614 King St. E.

Laundry and heating plant for hospital. Architects, Stewart & Witton, H. P. & L. Bldg. Masonry, A. H. Yeates, 74 Leeming street. Carpentry, James Huckson, 147 Belview ave. Painting, A. Kemp, 36 Fairholt Rd. Roofing, Dennis & Jocelyn, Walnut street north. Plumbing, Drake & Avery, 22 John St. S. Plastering, Arnold Clapham, 142 Duke Street. Iron Work, Hamilton Bridge Works Co., Barton and Bay streets. Stokers, Murphy Iron Works Company.

Kingston, Ont.
School addition, Victoria, planned by Board of Education. Masonry, H. W. Watts. Carpenter, Hunter & Harold. Heating and plumbing, McKelvey and Birch. Painting, T. Milo. Electric, H. W. Newman Co. Iron stairs, Toronto

Ornamental Iron Co., 25 Agnes street, Toronto. Vacuum cleaner, Hutton and [illegible]

Kemptville, Ont.

Armories, cost $11,500, Main, for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractor, Benj. Dillon, Brockville. Mason, W. Sherman, New Dublin. Two stys. Excavating done.

Macleod, Alta.

School, cost $5,000. Sec.-Treas., E. F. Brown. General contractor, J. S. Lambert. Architect, Mr. Whiddington, Lethbridge. Two stys., 33 x 34, brick construction. Seating tenders being received by Clerk. Foundations in.

Moncton, N.B.

Machine shops for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractors, Rhodes Curry Co., Amherst, N.S. Roofing, Jno. E. Wilson Co., Ltd., Sydney St., St. John, N.B., $7,500.

Montreal, Que.

School planned by School Commrs., Longueuil. Architect, A. Prefontaine, Montreal. General contractors, Guertin & Bouchard, 414 Parthenais St., Montreal. Steel, MacKinnon, Holmes & Co., Sherbrooke.

School, cost $196,000, for R. C. School Commrs., Longue Pointe (Lavaltree), c/o U. Lafontaine, 85 St. Catherine W. Architect, Z. Trudel, 238 St. Andre. General contractor, H. Demers, 47 Labelle. W. A. Wood, 246 Pine Ave. W., contractor for driving 900 piles for foundation, spruce or red pine.

Church, cost $150,000, for Stanley Presbyterian Church, Westmount. Pastor, Rev. W. D. Reid, 21 Lincoln Apts., Montreal. Architects, Hutchison, Wood & Miller, 50 Royal Ins. Bldg., Montreal. Painting and glazing, R. E. Jones, 69a McGill College Ave. Heating and plumbing, J. A. Gordon, 301 St. Antoine. Foundations in.

Fire and police station, cost $93,000, Longue Pointe (Notre Dame E.). Architect, Alp. Piche, 52 Victoria Sq., Montreal. General contractor, mason and carpenter, L. Langevin, 225 Parc Lafontaine. Steel, Structural Steel Co., New Birks Bldg. Plastering, Pascal Larocque, 341 De Lanaudiere. Painting, Chas. Larin, 468 Parc Lafontaine. Heating and plumbing, P. Page, 58 Amherst. Electric, Mr. Rochon. Roofing, Lariviere & Paquette, 112 Montcalm. Two storeys, 77 x 120.

Moose Jaw, Sask.

Elevator for Dom. Govt. Dept. of Trade and Commerce. Deputy Minister, F. C. T. O'Hara, Ottawa. General contractors, Barnet McQueen Co., Minneapolis, U. S. A. Capacity of 3 million bushels.

Saskatoon, Sask.

Elevator planned by Dom. Govt. Dept. of Trade and Commerce. Deputy Minister, F. C. T. O'Hara, Ottawa. General contractors, Barnet McQueen Co., Minneapolis, U. S. A. Capacity of 3 million bushels.

Toronto, Ont.

Theatre, cost $15,000, Queen and Bertmont, for Hutchinson & Webb, 1 Grenadier Rd. Architect, A. J. Rattray, 123 Bay street. Masonry, R. H. Harman & Son, 156 Dupont street. One storey, 26 x 110.

Theatre, cost $12,000, Roncesvalles, for Gowland & Burns. Architect, G. D. Redmon, Dineen Bldg. General contractor, H. J. Turner, 103 Roncesvalles avenue. Two storeys, brick construction, shingle roofing. Seating, galvanized iron.

School, Homewood Ave., for Board of Education. Sec.-Treas., W. C. Wilkinson. Mason, Jas. A. Wickett, 28 Toronto St. Carpenter, Frank Armstrong, 89 Oak St. Terra cotta, Geo. T. Gayton, 2 Wayland St. Plasterer, Beaver & Sons, 62 Winchester St.

Church, Franklin Ave., for Greek Ruthenians, Rev. Jos. Boyarczuk, 374 Sorauren Ave. Architect, J. P. Hynes, 199 Yonge St. Mason, Venn Bros., 776 Crawford St. Carpenter, S. Hogg, 242 Markham St. Brick construction, cement foundation, shingle roofing. Foundations in.

Winnipeg, Man.

Rifle range, cost $19,500, for Dom. Govt. Dept. of Militia & Defence. Minister, Eugene Fiset, Ottawa. General contractors, Jackson & Goldie, 66 Scott Bldg.

Church (Qu'Appelle ave.) for Knox Presbyterian congregation. Pastor, Rev. F. P. DuVal. Architect, J. H. G. Russell, 1110 McArthur Bldg. General contractors, McDiarmid & Co., Canada Bldg. Only excavating will be finished this year. New plans being prepared which will be ready in a month.

Business Buildings and Industrial Plants

Calgary, Alta.

Garage, cost $5,000, for A. J. Hay, 1936 11th St. W. Plans ready.

Hamilton, Ont.

Plant contemplated for Manistee Iron Works, Manistee, Mich. Negotiations in progress with Industrial Commissioner Marsh.

Hotel, cost $200,000, James and Stuart Sts., contemplated. Interested, A. M. Lewis, of Lewis & Arrell, and Mr. Morris Levy. Site purchased, plans will be prepared.

Montreal, Que.

Alterations and addition to store, cost $7,000, 173 Laurier ave. west, for Stuart Co., Inc., 173 Laurier Ave. W. Architect, L. R. Mont Briant, 230 St. Andre St., will receive tenders in one week. 50 ft. addition and new storey, concrete foundation, pressed brick construction, felt and gravel roofing. Plans drawn.

Office and warehouse, cost $10,000, 18 St. Helen, for H. Joseph & Co., 16 St. Sacrament. Architects, Phoenix Ass. Co., Ltd., 100 St. Francois Xavier street. Owner receiving tenders.

Garage and boathouse, cost $5,000, for J. L. Decarie, Que. Bank Bldg. Architect, Dalbe Viau, 76 St. Gabriel street. Plans in progress.

Regina, Sask.

Warehouse contemplated for Trussed Wall & Block Co., Saskatoon, who have applied to city for lots. Plans will be prepared.

Addition to hotel, cost $30,000, contemplated by A. G. Cook, Empire Hotel, 5 Railway St. 25 bedrooms will be added. Plans in progress.

Extensions to store, cost $5,000, S. Railway St., for Regina Trading Co., Ltd. Plans will be prepared.

St. Mary's, Ont.

Flour mill contemplated by Carter Milling Co. By-law to guarantee bonds. $50,000 to be voted on Sept. 27th. Capacity 600 bbls. per day.

Saskatoon, Sask.

Abattoir, cost $50,000, contemplated by the Saskatchewan Abattoirs, Ltd. Plans will be prepared.

Smithville, Ont.

R. J. Goring, general merchant, contemplates putting in new store front, building deeper show windows, re-arranging interior, installing new fixtures and clothes presses, plate glass required. Plans will be prepared.

Toronto, Ont.

Factory, cost $10,000, Noble St., planned for H. L. Wood Co., 421 Queen St. W. Tenders received by Owner for all trades. Two storeys, 42 x 60, brick construction, concrete foundation.

Warehouse addition, cost $3,500, 1528 Queen St. W., for Rumsly & Co., 1528 Queen St. W. Tenders received by Architect, C. M. Willmot, 436 Yonge St. Three storeys, 16 x 30, steel and brick construction, brick foundation, felt and gravel roofing.

One pair stores and residences, cost $6,000, St. Clair, for R. T. Robinson, 1310 Lansdowne Ave. Owner sublets. Two storeys, 38 x 50, brick construction, concrete foundation. Excavating started.

Four stores and residences, Bathurst street, near St. Clair, for C. C. Allen, 7 Callender St., who is receiving tenders for excavating, other trades called later, brick construction.

Factory, cost $250,000, Dupont and Christie, contemplated for Ford Motor Car Co., Richmond W. Site purchased, 200 x 206. Reinforced concrete buildings. Plans will be prepared.

Strathmore Press, 206 Simcoe St., will receive tenders for 3-storey addition and alterations, brick construction and foundation, steam heating, plate glass, felt and gravel roofing. Plans with Owner.

Weston, Ont.

Alterations and addition to bank building planned for Bank of British North America. Architects, Lindsay & Brydon, 65 Victoria St., Toronto. Tenders received by Architects until Sept. 30th. Bulk and separate tenders.

Winnipeg, Man.

Two stores, cost $5,000, for A. Beck, 515 Selkirk Ave. Architect, E. W. Craipton, 572 Ross Ave. One storey and basement, brick and steel construction, stone foundation, felt and gravel roofing. Plans in progress.

CONTRACTS AWARDED

Calgary, Alta.

Garage, cost $4,000, for Robertson & Carile, Dominion Bank Bldg. General contractor, R. W. Peach, 124 Premier Way W. One storey, 50 x 50, Excavating done.

Store and rooms, cost $5,000, 17th Ave. E., for J. Nevlin, 234 4th Ave., N.E. General contractor, W. Bloor, 617 4th Ave. N.E. Excavating done.

Store and offices, cost $18,000, for A. F. H. Mills, McDougal Block. Architects, Lang & Major, Board of Trade Bldg. General contractor, G. J. Davis, 2426 1st St. E. Two storeys, 25 x 120, brick construction, tapestry front, concrete foundation. Leaded lights, art glass, galvanized iron. Excavating done.

Alterations to factory, cost $8,000, 7th Ave. E. Owners and general contractors, Hudson's Bay Co., 7th Ave. Two storeys, 30 x 95, felt and gravel roofing. Excavating started.

Warehouse, cost $5,000, for W. R. Hull, Grain Exchange Bldg. General contractors, Fyshe, McNeile, Martin & Trainer, Dominion Bank Bldg. One storey.

Warehouse, cost $150,000, 11th Ave. E., for Pilkington Bros. Architects, Hodgson, Bates & Beattie, Grain Exchange. General contractors, Carter, Halls & Aldinger, Burns Block. Reinforced concrete construction, concrete foundation, felt and gravel roofing, electric lighting, steam heating, concrete floors, wire glass, 1 passenger and 1 freight elevator, galvanized iron, fire escapes. Excavating done.

Edmonton, Alta.

Stores and offices, cost $60,000, Jasper Ave. Owner and general contractor, G. D. Scott, 772 21st St. Architect, E. Underwood, c/o Owner. Three stys., 51 x 118, brick construction, concrete foundation. Excavating done.

Stores and hall, cost $15,000, for E. S. McQuaid, 506 Stephens Ave. Architect, W. D. Cromarty, 21 Dominion Block. General contractors, McSporrin & Co., 715 2nd St. Three storeys, 60 x 60, frame construction, concrete foundation. Excavating done.

Granton, Ont.

General store, cost $7,000, for Rowcliffe & Hodgson, Granton. General contractor, A. Finch, St. Mary's. Two storeys, white brick construction. Excavating done.

Montreal, Que.

Store repairs, cost $6,500, St. Peter St., for Estate Caverhill, St. Peter St., c/o Agents, Lewis & Badgley, Merchants Bank Bldg. General contractors, Agents, day labor. Four storeys, 30 x 120, stone foundation, felt and gravel roofing.

Offices, Beaver Hall Hill, for Guarantee Co., of North America, 57 Beaver Hall Hill. Architect, K. G. Rea, 54a Beaver Hall Hill. General contractor, Geo. A. Fuller, 210 Reed Bldg. Painting and glazing, C. A. Sharpe, 234 Craig E.

Store alterations, cost $4,000, St. Catherine W., for Estate G. W. Stephens, c/o Jno. Hyde, Merchants Bank Bldg. Architect, H. C. Stone, 84 St. Francois Xavier. General contractor, Jno. Wighton, 73 Fort street. Dividing large store into two. Two storeys, 25 x 30, stone foundation, terra cotta construction, felt and gravel roofing.

16 stall stable, cost $8,000, for W. Bastien, 125 Manufacturers. General contractor, Henri Hogue, 2835 Park Ave. Two storeys, 50 x 40, brick construction, felt and gravel roofing, concrete floors. Foundations in.

Brewery, cost $100,000, for Molson's Brewery, 906 Notre Dame E. Architect, M. Hetlinger, Boston, Mass., U. S. A., c/o S. W. Molson, Montreal. General contractor, E. G. M. Cape, New Birks Bldg. Steel, Dom. Bridge Co., Dom. Express Bldg. Brewery machinery required later. Four storeys, 150 x 200, concrete foundation, brick construction, felt and gravel roofing.

Store, cost $9,000, Mt. Royal, for O. Gratton, 323 Stuart St., Outremont. Architects, Gauthier & Daoust, 180 St. James St. General contractor, mason and carpenter, Owner. Plastering, A. Murray, 2404 Boyer. Painting and glazing, Owner, by day labor.

Woodworking factory, cost $6,000, Larin Ave., for Malone Moulding & Framing Co., 48 Beaver Hall Hill. General contractors, Anglins, Ltd., 65 Victoria St. Electric, Spencer & Aspinall, New Birks Bldg.

Greenhouse, cost $4,300, Westmount. Manager, G. W. Thompson. General contractors, Robertson Bros., Chestnut Ave., doing all the work. Foundations in.

Stable and coach house, cost $7,000, Westmount (Aberdeen Ave.)., for R. C. Patton, Quebec Bank Bldg. Builder, D. M. Long, rear 39 Windsor St., Montreal. Two storeys, 25 x 45, brick construction. Foundations in.

Three stores and flats, Outremont (Bernard). Architect and general contractor, Wilfrid Bessette, 97 St. James, or 258 Bloomfield Ave., will receive tenders for all trades shortly. Three stys., 60 x 75, concrete foundation, steel and brick construction, felt and gravel roofing.

Printing house alterations, cost $5,000, St. James, for La Presse, St. James St. General contractor, plastering and carpenter, Owner, by day labor. Painting, A. Boop, 287 St. George. Marble, Robt. Ball & Co., 174 Mountain.

Pattern shop, for National Bridge Co. Architect, Company's Engineer. General contractors, A. F. Byers & Co., 340 University. Roofing, Campbell, Gilday & Co., 663 St. Paul St. Brick construction, felt and gravel roofing. Foundations in.

Stable and coach house, cost $7,000, Westmount (Aberdeen), for R. C. Patton, Quebec Bank Bldg. General contractor, mason and carpenter, D. M. Long, rear 39 Windsor St., Montreal. Roofing, Richardson, Simard & Co., 745 Clarke. Painting, W. J. Chapman, 4151 St. Catherine W. Heating and plumbin, J. A. Gordon, 301 St. Antoine. Electric, Spence & Aspinall. Two storeys, 25 x 45.

Alterations to Excelsior and Box factory, cost $6,000, planned for Saguenay Mills, Ltd., 223 St. Ambroise. Premises purchased near present buildings, being altered to suit. Owners doing the work.

Mount Hamilton, Ont.

Grocery store for Luke Copple, 449 McNab St. N., Hamilton. Architect & general contractor, Louis Blatz, Alexander street, Hamilton. One storey, 22 x 28, frame construction, concrete foundation. Excavating done.

North Battleford, Sask.

Bank and offices, cost $25,000, King St. and 1st Ave., for Royal Bank of Canada. Architect, K. G. Rae, 54a Beaver Hall Hill, Montreal. General contractors, Purdy & Henderson, Ltd., 470 Granville St., Vancouver, and New Birks Bldg., Montreal. Two storeys, 36 x 54, brick and stone construction, cement foundation, marble, terrazo and oak floors, felt and gravel roofing.

Ottawa, Ont.

Factory, cost $20,000, Nelson, for Crown Lithographing Co., Wellington street. General contractor, A. Toms, Arlington street. Plumbing, M. M. O'Connell, Gloucester. Other contracts not let. Excavating done.

Factory, cost $14,000, Beech street, for M. J. O'Brien, Raglan Place, Renfrew. General contractor, A. E. Spooner, Windsor House, Ottawa. Solid brick construction, concrete foundation. Excavating done.

Garage, cost $3,000, Stewart, for Mrs. W. D. Erwin, Stewart St. Architect, C. J. Burritt, 193 Sparks St. General contractor, W. J. Hamilton, Westboro. 22 x 29, concrete foundation, concrete and stucco construction, felt and gravel roofing. Excavating done.

Business block, cost $100,000, Bank, for F. W. Carling, Metropolitan Building. Architect, C. P. Meredith, 126 Sparks St. Carpenter, Alex. Christie, Elgin St.

Port Arthur, Ont.

Addition to store, cost $25,000, Cumberland, for I. L. Matthews & Co. Architect, Fred Urry, 237 Arthur St. General contractors, Cox & Jones. Heating and plumbing, Marshall & Co. Electrical, Mahon Bros. 65 x 110, red clay construction, 1 freight elevator, store fronts and fixtures.

Petrolia, Ont.

Business block, cost $10,000, for Bruce & Hartley, Main & Bedford streets. General contractor, H. Clark. Two storeys, brick construction. Excavating done.

Preston, Ont.

Factory planned for Preston Chair Co. General contractor, James Eagle. Masonry, Wirsching Bros. Three storeys, 48 x 112, brick construction. Excavating done.

Quebec, Que.

Confectionery store and shop, cost $8,000, for W. McWilliams, 136 John St. Architects, Staveley & Staveley, 92 St. Peter St. General contractor, C. A. Vezina, 61 Desprairies. Show cases, etc. Beaver board for walls. Pastry and candy making machinery required.

Confectionery store and shop, cost $8,000, Joseph, for W. McWilliams, 136 John St. General contractor, carpenter and interior fittings, C. A. Vezina, 61 Desprairies. Mason and plastering, Ed. Belanger, Beauport. Steel, Eastern Canada Steel & Iron Works, St. Malo. Roofing, Nap. Barbeau, 36 Bridge St. Painting, Marier & Tremblay, Bridge St. Heating, plumbing and electric, Alex. Forest, 36 Garden St. Three storeys, 40 x 62, stone foundation, steel, red and Scotch brick construction.

Swift Current, Sask.

Store, cost $4,400, for Dr. W. H. Field, McGinty ave. Architect and general contractors, Francis & Wheat, 13th ave.

St. John, N.B.

Grain elevator for C. P. R. Co. General manager, F. R. Hodge, Montreal. General contractors, Jno. S. Metcalf Co., Montreal.

Bank building, Main St., for Royal

Bank of Canada. Manager, T. B. Blair, King St. Architect, K. G. Rea, Beaver Hall Hill, Montreal. General contractor, Jno. Flood, 123 Duke St. Carpenter, Ernest Green, Tisdale House, St. John, N.B.

Stratford, Ont.

Factory, cost $35,000, Douro, for Farquharson-Gifford Co., Douro St. Architect, J. S. Russell, Downie St., Stratford. Roofing, Philip Carey Co., 77 Front St. E., Toronto. Plumbing, Peter & Sylvester, Stratford.

Thorold, Ont.

Alterations to bank building, cost $5,000, Main St., for The Royal Bank of Canada. Architect, A. E. Nicholson, St. Catharine. Mason and roofing, John J. Nichols & Sons, St. Catharine. Carpenter, Thos. J. Joyce, Thorold. Painting and glazing, Leach & Jones, St. Catharines. Plumbing and heating, John Peart, St. Catharines. Electric work, Sandham & Roberts, St. Catharines. Two storeys, 35 x 50, new brick and cut stone front construction, stone foundation, felt and gravel roofing.

Toronto, Ont.

Store and residence, cost $5,000, Roncesvalles near Howard Park. Owner and general contractor, E. E. Rutherford, 279 St. George street. Architect, J, G. Hedges, 210 Clinton street. Plastering, Sparks & Son, 188 Sorauren Ave. Three storeys, 20 x 55, brick construction and foundation, felt and gravel roofing.

Drug store, cost $4,000, for T. W. Hutchison, 11th and Cheadle. Architect, Mr. Ferris. General contractors, Francis & Wheat, 13th Ave.

Warehouse, planned for Moose Grocery. General contractors, Western Constr. Co. Work will be started soon.

Bank, cost $1,000,000, King and Yonge, for Dominion Bank, 59 Yonge St. Architects, Darling & Pearson, 2 Leader Lane. General contractors, Can. Stewart Co., C. P. R. Bldg. Heating and plumbing, W. J. McGuire, Ltd., 86 King W. General contractors will do all work except heating and plumbing. Steel work started.

One pair stores and residences, cost $5,700, Davenport Road. Owner and general contractor, I. F. Schooley, 283 Concord Ave. Two storeys, 40 x 56, steel and brick construction, concrete foundation, felt and gravel roofing. Excavating done.

One pair stores and residences, cost $7,000, Royce Ave. Owner and general contractor, M. Yetman, 997 Dufferin St. Two storeys, 38 x 48, brick construction, stone foundation, felt and gravel roofing. Excavating done.

Warehouse, cost $60,000, Radenhurst, for Labatt Brewing Co. Architect, C. F. Wagner, 15 Toronto St. Mason, Teagle & Son, 55 Boswell Ave. Carpenter, S. T. Avent, 56 Conduit St. Metal windows, Trussed Concrete Steel Co., 23 Jordan St. Steel, Hepburn & Disher, 18 Van Horne St. Painting, Robt. Dale, 440 Shaw St. Plumbing, Fiddes & Hogarth, 122 King E. Galvanized iron, A. Matthews, 256 Adelaide W. Excavating done.

Biscuit factory, cost $200,000, King E., for Christie Brown Co., 43 Duke street. Architects, Sproatt & Rolph, 36 North St. General contractors, Jennings & Ross, King and Spadina. Steel, ornamental iron and stair cases, McGregor & McIntyre, Pearl St. Electric wiring and telephone, E. F. W. Salisbury, 18 Fenwick Ave. Heating and plumbing, Robt. Long & Sons, Richmond St. E.

Winnipeg, Man.

Two stores, cost $6,000, for A. Beck, 515 Selkirk Ave. Architect, E. W. Crompton, 572 Ross Ave. General contractors, Blow Bros., Furby St.

Garage, cost $22,000, Hargrave street, for T. Eaton & Co., Ltd. Carpenter and general contractors, Carter, Halls & Aldinger, Union Bank Bldg. Steel, Vulcan Iron Works, Winnipeg. Owners are doing painting, heating, plumbing and electric. One storey, 100 x 120, brick and steel construction, concrete foundation, corrugated iron roofing. Excavating done.

Residences

Calgary, Alta.

Residence, 18th Ave. W., for Catholic Diocese. Architect, Mr. Haroigan, Alberta Block. Two storeys, 80 x 100, frame, concrete foundation. Plans ready.

Residences, cost $10,000, for Parish of St. Annes, E. Calgary. Architect, Mr. Corin. Two storeys, 40 x 34, brick construction. Plans ready.

Ford City, Ont.

Residence, cost $5,000, Sandwich St., for Theo. Pratt. Ohio brick construction, cement and brick foundation. Plans in progress.

London, Ont.

Two residences, cost $10,000, Waterloo, for R. Ross, cor. York and Thames Sts. Two storeys, white brick construction, concrete and stone foundation. Plans drawn.

Apartment house, cost $15,000, Horton, contemplated by A. Hartmann, 300 Dundas St. Architect to be chosen. Three storeys, 50 x 80, white brick construction, stone and concrete foundation, tin or felt and gravel roofing. Plans will be prepared.

Residence, cost $7,000, contemplated for Major Beattie, 514 Dundas St. Architect to be chosen. Red pressed brick construction, stone and concrete foundation, slate roofing.

Montreal, Que.

Three pair semi-detached residences, cost $25,000, Westmount, contemplated for J. H. Norris, 122 Arlington Ave. Work will be started this fall if possible.

Ottawa, Ont.

Residence, cost $3,500, Arthur, for J. E. Wilson, 793 Somerset St. Two stys., brick veneer construction, stone foundation. Plans in progress.

Residences, cost $6,000, 4th Ave., for Geo. Johnston, 14 Chamberlain. Stone foundation, brick veneer construction. Plans in progress.

Regina, Sask.

Residence, cost $10,000, Albert street. Architects, Clemesha & Portnall, 1721 Scarth. Brick and stone construction, brick and concrete foundation. Plans in progress.

St. Marys, Ont.

Residences, cost $15,000, for Thos. Russell, c/o Weir & Weir. Architect to be selected. White brick construction, Stone foundation. Plans will be prepared.

Toronto, Ont.

One detached residence, cost $3,500, Walmsley Blvd., for Canadian Investments, Ltd., 708 C. P. R. Bldg. Architect, J. M. Jeffreys, 708 C. P. R. Bldg. Bldg. Supt., A. W. Adams, 55 West Lodge Ave. Owner employs regular staff. 2½-storeys, 22 x 34, brick construction, stone foundation. Plans drawn.

One detached residence, cost $5,000, Rowanwood, for J. McLean, 120 King St. W. Architect, C. E. Tyler, 85 Cumberland St. Contracts not yet awarded. 2½-storeys, 22 x 38, brick construction, stone foundation.

Windsor, Ont.

Residence, cost $2,800, Gladstone Ave., for Dan McKenzie, Hall Ave. Tenders received by Owner until Sept. 20th. Two storeys, 28 x 32, Canton brick construction, cement block foundation.

Winnipeg, Man.

Residence, cost $4,000, McDermot, for A. Dunlop, 875 Bannatyne ave. Two storeys, 22 x 30, frame construction, stone foundation. Plans ready.

Residence, cost $3,000, Rosedale Ave., for C. G. Johnson & Co., 26 Canada Life Bldg. Two storeys, 22 x 26, frame construction, stone foundation. Plans ready.

CONTRACTS AWARDED

Calgary, Alta.

Residence, cost $5,000, Sunalta, for G. H. Webster, 911 15th Ave. W. General contractor, R. N. Bolton, 2328 1a St. E. Two storeys, 28 x 36, frame construction, concrete foundation. Excavating done.

Residence, cost $5,000. Architects and general contractors, Alberta Investment and Insurance Brokers, 514 New Burns Block. Two storeys, 30 x 32, frame construction, concrete foundation. Excavating done.

Residence, cost $5,000. Architect and general contractor, J. W. Knoepfli, 504 Maclean Block. One storey, 32 x 36, frame construction. Foundations in.

Residence, cost $5,000, Broadview. Owners and general contractors, Barnes Bros., 1166 Boulevard N.W. Two stys., 19 x 44, frame construction, concrete foundation. Foundations in.

Edmonton, Alta.

Residence, cost $5,000, for G. H. McDonald, King's Drive. Architects, Magoon & MacDonald, Tegler Block. General contractor, L. F. Kelsey, General Delivery. Two storeys, 25 x 34, brick and frame construction, concrete foundation. Excavating done.

Residence, cost $7,000, Grierson St., for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Architect, A. M. Calderon, 259 Jasper Ave. W. General contractor, W. C. McArthur, 523 Sinclair St. Two storeys, 32 x 42, brick and frame construction, concrete foundation. Excavation done.

Residence, cost $5,000. Architect and general contractor, C. R. Horne, 24 Muskoka St. Two storeys, 24 x 30, frame construction, concrete foundation. Excavating done.

Ford City, Ont.

Double residence, cost $5,000, Sandwich

St. E., for Fred White, Jeweler, Walkerville. Architect, general contractor and builder, Peter Blonde, Walkerville. Canton brick construction, cement and brick foundation, plumbing. Excavating started.

Hamilton, Ont.
Residence, cost $4,000, Herkimer St., for Miss Gillespie, Hess & Herkimer St.s. General contractor, W. A. Smith, Sherman Ave. S. Brick construction. Permit granted.

Two residences, cost $2,600 each, for Henry Smith, 74 Wentworth St. S. General contractors, Hobbs & Son, 313 Emerald St. N. Brick construction, concrete foundation.

Melfort, Sask.
Six residences for Terminal Cities Land Co., Farmer Bldg., Winnipeg. Manager, J. F. Hauson. General contractor, Melfort Planing Mill. Frame construction, concrete foundation. Excavating done.

Mt. Hamilton, Ont.
Six residences, cost $3,000 each, Coral ave. Architect and general contractor, Chas. H. Brayley, 195 Gibson ave., Hamilton. Contracts for brick, carpentry, etc., to be awarded separately. 25 x 38, brick construction. Georgia pine finish. Foundations in.

Montreal, Que.
Eighteen flats, cost $11,000, Chapleau, Owner and builder, S. Christin, 185 Poupart. Three storeys, 15 x 48, concrete foundation, brick construction, felt and gravel roofing.

Residence, cost $6,000, Old Orchard ave. Owner and builder, Louis C. Tarlton, 393 Wiseman ave. Two storeys and basement, 21 x 50, cement foundation, brick construction.

Flats, cost $5,000, Verdun, for Mr. Lalonde, c/o Mr. D. Lanthier, 1332 Wellington. Architect and general contractor, D. Lanthier, who will receive tenders. Work to start about Oct. 1st. Concrete foundation, brick construction, felt and gravel roofing.

Apartment house, Lorne Crescent. Owners and general contractors, Hand & Pick, 609 Belmont Ave., Westmount. Architect, D. J. Crighton, Jacobs Bldg. Steel, MacKinnon, Holmes & Co., Sherbrooke.

Two flats, cost $4,000, Notre Dame W. Owner and general contractor, Jos. Rozon, 99 Delisle. Three storeys, 20 x 55, brick construction, felt and gravel roofing. Foundations in.

Alterations to flats, cost $10,000, for A. Hamilton Gault, 595 Sherbrooke W. General contractors, Anglins, Ltd., 65 Victoria St. Tiling, Mosaic & Tile Co., rear 483 Bleury St.

Two flats, cost $4,000, Notre Dame W., for E. & H. Madore, 2560 Notre Dame W. Three storeys, 20 x 55, brick construction, felt and gravel roofing. Work is being done by day labor.

Two flats, cost $9,000, Westmount (York Ave). Builder and general contractor, J. B. Scott, 30 Springfield Ave. Two storeys, 25 x 50, cement foundation, reinforced concrete construction.

Swift Current, Sask.
Residence, cost $5,000, for D. A. Small, hardware merchant. Architect and general contractor, L. G. Linton, 12th ave.

Toronto, Ont.
Two pair residences, cost $12,000, Alberta St. Owners and general contractors, Anglin's Ltd., 507 Lumsden Bldg. Work done by day labor. 2½ storeys, 36 x 42, brick construction and foundation.

Four residences, cost $20,000, Highview Crescent. Owner and general contractor, Mr. Goodyear, 51 Highview Crescent. Mason, A. E. Brobyn, 153 Campbell Ave. Ready to receive tenders for wiring, heating, plumbing, painting, plastering and roofing. 2½-storeys. Two roofed, 2 walls going up.

One detached residence, cost $4,800, Oakwood. Owners and general contractors, Shaw Bros., 501 Manning Ave. 2½-storeys, 24 x 36, brick construction, stone foundation.

One pair residences, cost $5,000, Armstrong Ave., for Jas. Murray, 12 Olive Ave. General contractor, F. Clegg, 509 Manning Ave., will sublet. Two stys., 34 x 42, brick construction, stone foundation. Excavating done.

Two residences, cost $10,000, Rosemount. Owners and general contractors, Anglin's Ltd., Lumsden Bldg. Work day labor. One residence walls going up, 1 residence foundation in. 2½-stys., brick construction.

One detached residence, cost $4,500, Gothic. Owner and general contractor, S. Stewart, 16 Thorold, will sublet. 2½-storeys, 23 x 36, brick construction, stone foundation, lime and sand plastering.

Eight residences, cost $4,000 each, Pembroke St.. Owners and general contractors, A. E. McTaggert & Sons, 268 Dovercourt Road. Work day labor. Four residences plastering, balance not started. Two storeys, 17 x 45, brick construction and foundation.

Welland, Ont.
Residence, cost $4,500, Griffith St., for W. A. McKenney. General contractor, Leslie Smith. Work day labor. 2½-stys., 25 x 38, brick veneer construction, cement foundation, shingle and asbestos roofing.

Winnipeg, Man.
Double residence, cost $18,000. Owner and general contractor, A. Macaw, 804 Trust & Loan Bldg. Two storeys, 31 x 63, red brick construction, stone foundation. Excavating done.

Residence, cost $4,450, Machray, for Heinitz Investment Co., builders, 457 Pacific. Two storeys, 26 x 28, frame construction, stone foundation, oak and maple floors. Excavating done.

Power Plants, Electricity and Telephones

Aurora, Ont.
Electrical apparatus required by Town Council. Mayor, W. J. Baldwin. Tenders received by Clerk until Sept. 24th, for the supply of fire pumps, motors, auxiliaries, etc. Plans, etc., at office of Clerk, S. H. Lundy.

Brampton, Ont.
Hydro-electric extension planned. Clerk, W. H. McFadden. By-law passed by Council to raise $15,000, by issue of debenture.

Montreal, Que.
Extension to power house at Lachine. Sec.-Treas., Hector Charette. Plans in progress.

Ottawa, Ont.
Underground services, cost $11,995, in House of Commons, planned by Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Chief Electrician, James Johnson. General contractor, A. G. Marshall, 3 O'Connor St.

Owen Sound, Ont.
Hydro power contemplated for the town. Clerk, Chas. Gordon. Power to be developed at Eugenia Falls on Beaver River by Provincial Commission. Transmission line about 30 miles.

Prince Albert, Sask.
Steam power house and plant, cost $275,000, planned by City Council. Clerk, O. Davidson. By-law passed Sept. 6th.

Regina, Sask.
Gas plant contemplated by C. E. McQuaid, 1930 Retallach St., Regina, acting for an American Company who are entering into negotiations with Regina City Council for the purpose of securing a franchise to put in a gas plant.

St. Catharines, Ont.
Power plant planned by City Council. Clerk, J. A. Pay. Estimate received from Hydro-electric Commission. Plant to cost $90,000, street lighting system, $26,000. Council approves. Ratepayers to vote.

St. John, N.B.
Power house for St. John Rly. Co. Manager, H. M. Hopper, Dock street. General contractors, A. R. C. Clark & Son, 51 Water St.

Sault Ste. Marie, Ont.
Deepening power canal, cost $300,000, for Lake Superior Power Co. General contractors, Soo Dredging & Construction Co.

Souris, Man.
Lighting system planned. Clerk, W. J. Breaky. By-law voted on Sept. 2nd was passed. Council will call for tenders immediately for poles, wires, etc.

Winnipeg, Man.
Tenders received by Board of Control till Sept. 18th for erection of ornamental poles on Osborne street from River Ave. to Corydon Ave.; Hargrave St., Portage Ave., Assiniboine Ave., Main St., Sutherland ave., N. City limits. Specifications at Office of Engineer, J. G. Glassco, 54 King St. Secretary, M. Peterson.

Business Notes

Campbellton, N.B.
Foundry owned by McLennan Foundry & Machine Co., Ltd., burned. (W. F. MacNaught). Loss covered by insurance.

Deux Rivieres, Ont.
Warehouse and office, east of North Bay, of Hawkesbury Lumber Co., burned. Also hotel, owned by M. Cottenham; post office, owned by Dom. Govt.; residence, owned by Postmaster Jardine; station buildings, owned by C. P. R.; residence of J. R. Bowles.

Kincardine, Ont.
Grist mill, owned by J. W. Rea, burned. Three storey building. Loss $12,000. Insurance $6,500.

Tenders and For Sale Department

TOWN OF WALKERVILLE

Tenders for Pavements and Sewers

Sealed tenders will be received by registered post, addressed to the undersigned, up to **Tuesday, the 23rd day of September, 1913, at noon,** for the construction of pavements and sewers in the following streets and alleys in the Town of Walkerville.

1. Pavement in Alley between Walker Road and Monmouth, from Niagara to Huron.
2. Re-paving portion of Victoria Road from Wyandotte Street to Assumption Street, and portion of Sandwich Street from Victoria Road to West Town limit, and portion of Walker Road from Ontario Street to Ottawa Street—in the Town of Walkerville.
3. Extension of West Main Sewer and Relief Main Sewer in said Town of Walkerville.

Plans and specifications may be seen on application to Owen McKay, C.E., Walkerville.

Tenders must be accompanied by a marked cheque payable to the Town Treasurer, equal to 2½ per cent. of the amount thereof. Should any party whose tender is accepted, fail to execute the necessary contract and bond for the due fulfilment of the same, his deposit will be forfeited to the Town.

Deposits of unsuccessful tenderers will be returned.

The lowest tender not necessarily accepted.

The names of two responsible persons, willing to act as sureties must accompany each tender.

CECIL H. ROBINSON,
Town Clerk.

Walkerville, Sept. 11, 1913. 38

Department of Militia and Defence

Extension to Stables, Tete-de-Pont Barracks, Kingston, Ont.

Notice to Contractors

Sealed tenders, marked on the envelope "Tender for Construction of extension to stables, Tete-de-Pont Barracks, Kingston," and addressed to the Director of Contracts, Department of Militia and Defence, Ottawa, will be received until noon, **September 30th instant,** for the construction of an extension to the stables at Tete-de-Pont Barracks, Kingston, Ont.

Specifications may be seen and full particulars obtained at the offices of the Officer Commanding the 3rd Division, Kingston, Ont., and the Director General of Engineer Services, Headquarters, Ottawa.

Tenders must be made on the form supplied by the Department of Militia and Defence, and accompanied by an accepted cheque on a Canadian Chartered Bank, for ten per cent. (10 p.c.) of the amount of the tender, payable to the order of the Honourable the Minister of Militia and Defence, which amount will be forfeited if the party tendering declines to enter into or fails to complete the contract in accordance with his tender.

The Department does not bind itself to accept the lowest or any tender.

EUGENE FISET,
Deputy Minister.

Ottawa, September 2, 1913.

Newspapers will not be paid if this advertisement is inserted without authority from the Department.—47356. 38-39
H.Q. No. 44-7-73.

Tenders for Bridge Construction

Sealed tenders, plainly marked as to contents, will be received by A. B. Coutts, Esq., Clerk, Township of Vespra, up to noon of **Saturday, September 27th, 1913,** for the construction of a reinforced concrete beam bridge over Willow Creek, Lot 13, Con. IV., Township of Vespra, at or near Midhurst, known as Findley's Bridge.

Plans, specifications and all necessary information may be obtained at the office of A. B. Coutts, Esq., Twp. Clerk, Barrie, Ont., or at the office of the undersigned, 57 Adelaide St. East, Toronto.

The lowest or any tender not necessarily accepted.

FRANK BARBER, Engineer.

Toronto, Sept. 16, 1913. 38

Notice to Contractors

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on **Tuesday, September 23rd, 1913,** for the construction of the following sewers:—

Earlscourt Drainage System, No. 3 Outlet;
Dufferin St., 500 ft. north of St. Clair Ave. to 90 ft. north of Morrison Ave.;
Beaver Ave., Lightbourne Ave. to 431 ft. west;
Brandon Ave., Primrose Ave. to Dufferin St.;
Lane 1st W. Christie St., Garnet Ave. to Yarmouth Ave.;
Lane 1st E. Parliament St., Spruce St. to Carlton St.;
Lane 1st W. Spadina Ave., Oxford Ave. to north end;
Lane 2nd N. Bloor St., Symington Ave. to Perth Ave.;
Lane 1st N. Bloor St., Bartlett Ave. to Gladstone Ave.;
Elmer Ave., Queen St. to Norway Place;
Ashdale Ave., Queen St. to Applegrove Ave.;
Wilton Ave., Storm Overflow Sewer Sec. No. 3;
Danforth Ave., Storm Overflow Sewer Sec. No. 1;
Bloor St., Keele St. to E. limit of former West Toronto;
Morrison Ave., Dufferin St. to Harvie Ave.;
Lane 1st N. Queen St., Fuller St. to West End.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications may be seen and forms of tender obtained at the office of the Commissioner of Works, Toronto.

Tenderers shall submit with their tender, the names of two sureties (approved of by the City Treasurer, not members of the City Council, or officers of the Corporation of the City of Toronto) or in lieu of said sureties, the bond of a Guarantee Company approved of as aforesaid.

The usual conditions relating to tendering as prescribed by the City By-law must be strictly complied with.

The lowest or any tender not necessarily accepted.

H. C. HOCKEN, Mayor,
Chairman, Board of Control.

Toronto, September 11, 1913. 38-38

ARCHITECT

For an experienced, up-to-date architect, an excellent proposition is offered, by an established Consulting Engineering & Architectural Corporation, based on a co-operative plan, offices in Cleveland, Detroit, Buffalo and New York City. The position requires a man who is thoroughly capable of handling an architectural department independently, both inside and outside work. Highest references and $1,500 stock investment required. Contract with salary, commission and interest in business guaranteed. Answer, "Architect," Contract Record, Toronto. 38

Board of Education

Sealed tenders, whole or separate, addressed to the Secretary-Treasurer of the Board, will be received until

Friday Noon, September 26th, 1913

for the several trades required in the erection of

New School Building, Regal Road, and Enlargement of Building, Kimberley Avenue

ALSO

Plumbing, Heating and Electric Wiring at Balmy Beach School, Pape Avenue School and McMurrich School.

Specifications may be seen, and all information obtained at the office of the Superintendent of Buildings, City Hall. Each tender must be accompanied with an accepted bank cheque for five per cent. of the amount of tender or its equivalent in cash. Tenders must be in the hands of the Secretary-Treasurer, at his office in the City Hall not later than 12 o'clock noon on the day named, after which no tender will be received. The lowest or any tender will not necessarily be accepted.

W. C. WILKINSON, Sec.-Treasurer.

W. O. McTAGGART,
Chairman of Committee.

38

MacLean Daily Reports Limited

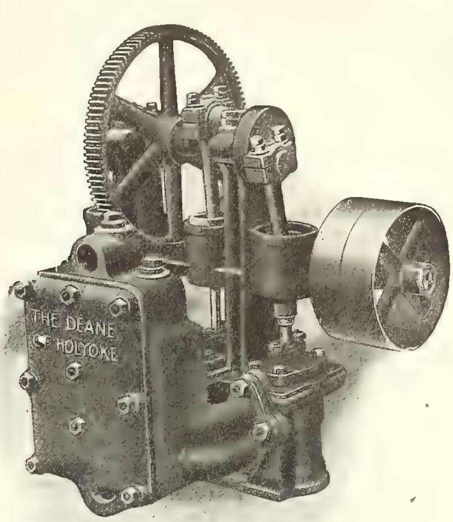
The only systematic method yet devised for reporting BUILDING AND ENGINEERING projects from their inception to completion. Ask us for Rates and Specimen Reports.

220 King Street West - TORONTO

AGENTS WANTED

High Class Artificial Stone Company requires agents in every city to sell building stone, ornamental work, pipes, roof and floor tiles, etc. Liberal commission allowed. Address C. P. c/o "Contract Record," Toronto. 36-37-38

DEANE POWER PUMPS



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TANK SERVICE

THE JOHN McDOUGALL CALEDONIAN IRON WORKS CO., LIMITED

Works: Seigneurs & William Sts., MONTREAL.
Manufacturers of Boilers, Castings, Condensers, Elevators, Engines, Filters, Forgings, Hydraulic Machinery, Pumps, centrifugal and reciprocating, Steam Turbines, Tanks, Water Wheels, Water Works Plants.

Jennings & Ross
Limited

Engineers and Contractors

Royal Bank Bldg. - Phone Adelaide 292
King and Spadina
Toronto

Kingston Road Sewer
Showing heavy timbering necessary owing to depth of excavation.

BOILER AND STEEL PLATE WORK

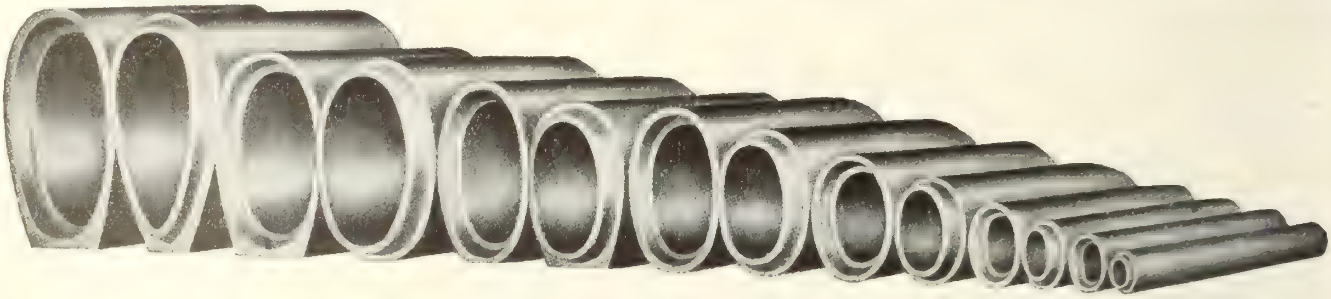
Of All Kinds

We are manufacturers of: Boilers, Steel Tanks, Smoke Stacks, Ore Buckets, Ore Cars, Steel Flumes, Etc. Any size or style.

Hoisting Machinery a Specialty

Let us quote on your requirements. *All Work Guaranteed.*

MARSH & HENTHORN, LTD., - Belleville, Ont.



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properly built of properly made

- Reinforced Concrete Pipe -

LAST FOREVER.

OUR MATERIAL, SYSTEM and PRODUCT have been tested and approved by EMINENT ENGINEERS. NO RUST, NO ROT, NO FROST-BREAKS, NO PRESSURE-BREAKS, NO HIGH PRICES, NO DELAYS IN PROCURING, NO TROUBLE IN HANDLING.

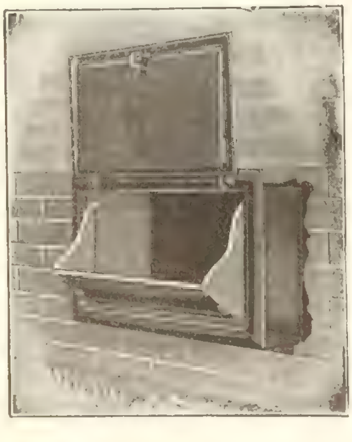
STANDARD REINFORCEMENT, or SPECIAL if required. Stock sizes 6 in. to 60 in.

Patronize Experienced and Reputable Manufacturers.

Catalogue and prices on application.

Dominion Concrete Company Ltd.

Kemptville, Ontario



EQUIP YOUR CELLAR

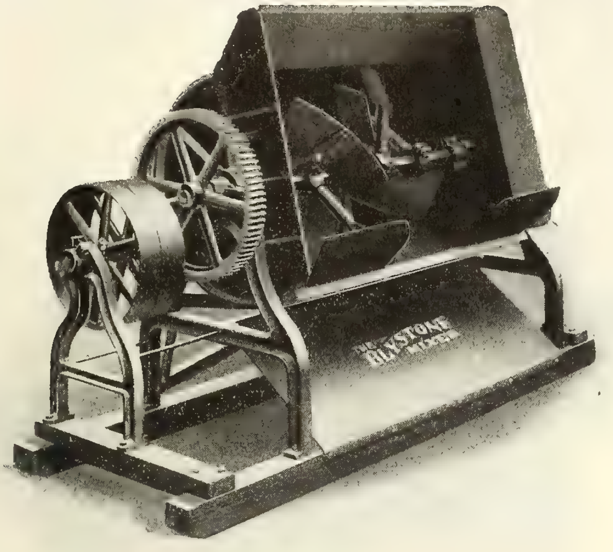
with one of our "Majestic" Coal Chutes which is the neatest and best equipment for any cellar. It is easily installed in either new or old houses. It permits coal, wood or vegetables to be put into the cellar without disfiguring the building in any way. And unlike a glass window it cannot be broken. The hopper can easily be removed if desired to put in very coarse coal or wood, or if a waggon chute is used. It swings back into the chute and allows the door to be closed. The door is made to lock when opened upward, and protects the wall or siding above the chute, and can be released only when closed. We make three standard sizes. There's a size that's just right for your cellar and your requirements. No. 1—22 x 16 x 13. No. 2—27 x 16 x 13. No. 3—33 x 22 x 18.

Send for our illustrated booklet, it shows and describes our full line of Coal Chutes

The Galt Stove & Furnace Co., Limited, GALT, ONT., CAN.

Toronto Representatives: Black Building Supply Co., Mail Building
Montreal Representative: E. F. Dartnell, No. 8 Beaver Hall Square
Gorman, Clancey & Grindley, Agents, Calgary and Edmonton, Alberta

The Best Service at Lowest Cost



The Blystone Skid Mixer
The perfect design and construction of this mixer reduces the working cost to a minimum and effects the greatest ease in operation. All working parts are strongly made and will not get out of order.
Easy to work—Easy to Clean High efficiency—Low cost

SEND FOR PARTICULARS

The Blystone Machinery Company
61 Railroad St., CAMBRIDGE SPRINGS, Pa., U.S.A.
Full line of Blystone Mixers carried in stock by
The A. R. Williams Machinery Co., Limited, Toronto, Ont.
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Corrugated Iron

"Metallic" is the only corrugated iron that actually has deep corrugations. We make our corrugated iron from sheets of especially made metal that holds its shape, and the corrugations remain straight and true indefinitely. Ask us to send you all the facts about our corrugated iron. Metal experts—men who know—specify "Metallic" when ordering corrugated iron. Let us tell you why. We can supply you with either galvanized or painted sheets, flat or curved.

THE METALLIC ROOFING CO.
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TORONTO AND WINNIPEG

Contractors' Acetylene Flare Lights

Made in Two Sizes

SIZE NO 1—

8,000 Candle Power, operates 12 Hours on 18 lbs. Carbide.

Price F.O.B. Ottawa $95.00.

SIZE NO. 2—

1,000 Candle Power, operates 12 Hours on 8 lbs. Carbide.

Price F.O.B. Ottawa $65.00.

Manufactured by

International Marine Signal Co. Limited
Ottawa, Canada

Used Machinery and Contractors Plant

FOR SALE

1—40 H.P. Stationary Boiler and Engine
1—80 H.P. Tubular Boiler
2—60 H.P. Tubular Boilers
1—50 H.P. Tubular Boiler
1—2 Yard Ore Car
1—1/2 Yard Milwaukee Concrete Mixer (New)
1—30 H.P. D.D. Electric Hoist
1—No. 4 Champion Stone Crusher
1—No. 5 Pulsometer Pump (New)
2—6x5 3/4x6 Duplex Pumps
1—Stone Elevator for No. 5 Austin Crusher
1—20 H.P. Upright Boiler
3—2 H.P. Electric Motors, A.C.
1—14 H.P. White Traction Engine
1—25 H.P. Portable Boiler and Engine

The above machines are but slightly used and are in good working order.

Fleming Machinery Company
340 Sparks Street, Ottawa, Can.

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INSPECTED AND LABELLED UNDER THE DIRECTION OF THE UNDERWRITERS LABORATORIES (INC.)
SHEET METAL WORKERS, SKYLIGHTS, CORNICES AND WINDOWS.
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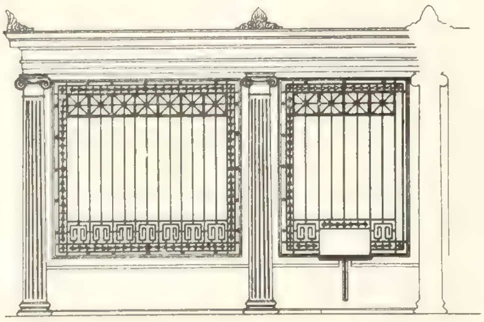

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Tellers Cages, Brass Floor Railings
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We have a large, modern plating plant, enabling us to furnish all the latest electro-plated finishes.

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SOLE producers of the Beautiful Royal Dominion marble quarried at South Stukely, Que. A card or 'phone call will bring our representative to submit figures on any class of marble work. Address all letters to the Company P.O. Box 1166, Montreal.

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Timber Preservers and Fireproofers

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Sole owners of the B. M. patent process of lumber preserving.

British Method Best Mthod

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Hotchkiss Steel Forms

For walks—curbs—curb and gutter combined—driveways, roads, pavements, etc.
The benefit of 20 years experience as successful contractors.

Yours for the Asking

Hotchkiss Lock Metal Form Co.
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Erected at Seven Falls, Quebec, Distributor Pipe and Branches, under 450 ft. Head.

Structural and Steel Plate Work

is our specialty, We fabricate and erect from your drawings, or will design your structure for you.

No Work Too Large for us to handle in the minimum of time. May we estimate on your requirements?

WALSH PLATE & STRUCTURAL WORKS, LIMITED

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Block, Sawed, Planed
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Chicago Mill and Storage Yard:
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Quarries and Mills { Bedford, Ind.
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THE H. & E. PATENT BALL-BEARING LIFTING JACKS

For Railway and Bridge Work, Contractors' and Builders' Use

Made by practical Jack Builders. Material: best grades of malleable iron and steel Fully guaranteed as to durability and efficiency. The long even stroke of the lever together with the design and careful construction of the jack, makes it the quickest and easiest working lifting appliance on the market. Made in plain and foot-lift styles. Adapted to all classes of work where a lifting jack can be used. Sizes from 8 to 50 tons capacity now complete. Send for prices and discounts.

To any responsible Firm or Railway in Canada any of these jacks will be sent on 30 days trial.

MANUFACTURED BY

Canada Lifting Jack Co., Ltd.

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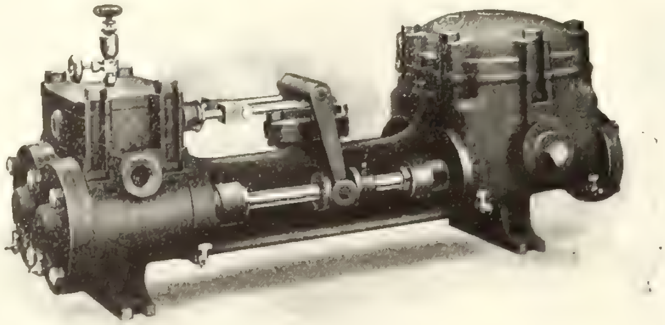
Stock carried by F. H. Hopkins & Company, Montreal

COMPLETE EQUIPMENT FOR THE

POWER HOUSE

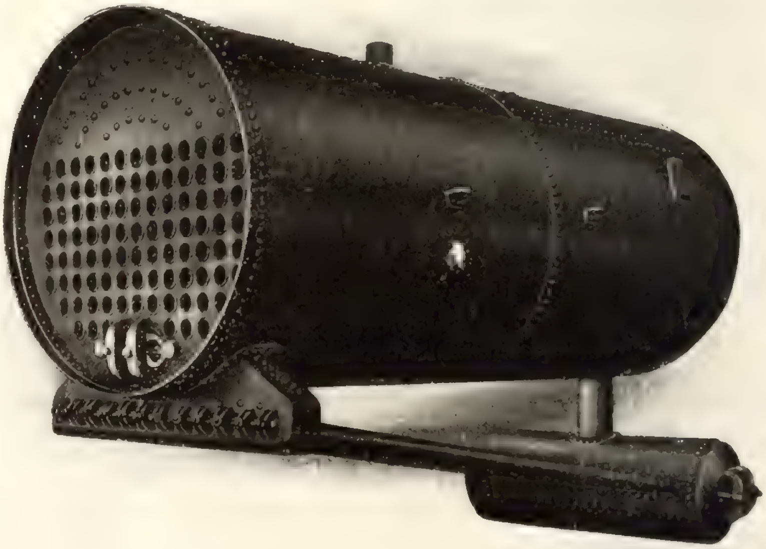


Duplex Steam Boiler Feed Pumps

These new standard pumps can be furnished in sizes up to 1700 Imp. gallons per minute against a working pressure of 150 lbs. per square inch with steam pressure of 100 lbs. per square inch.

The Barrow Combination Boiler

Abundant steam and water space, perfect circulation and perfect combustion.



CANADIAN ALLIS-CHALMERS, LIMITED

Head Office: King and Simcoe Sts., Toronto

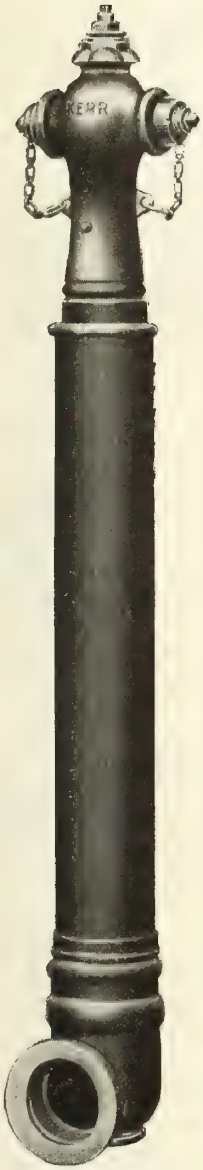
Air Compressors, Rock Drills, Rock Crushers, Saw Mill Machinery, Steam Pumps, Steam Specialties, Steam Turbines, Structural Steel, Transmission Machinery, Turbine Pumps, Water Wheels.

KERR

Hydrants

and

Gate Valves



are made with Hub for Cast Iron, Wood or Steel pipe spigots. They have full area of waterway, and are strong, compact and modern in design and construction.

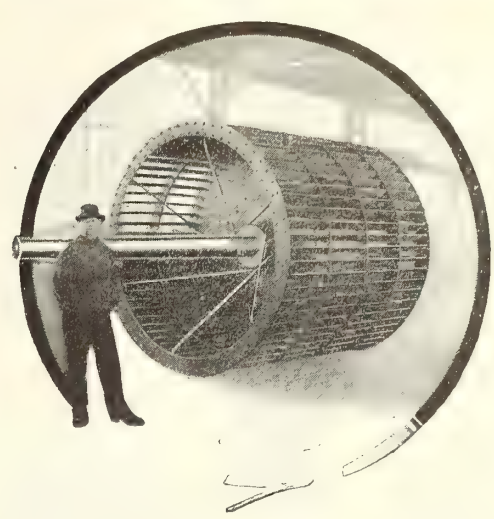
Standard Compression Hydrant

Send us your Specifications and Enquiries.

Prompt attention given.

6″ Hubbed

THE KERR ENGINE CO.
LIMITED
WALKERVILLE, ONT.



Fresh Air for 9,000 People Delivered by ONE

"Sirocco"

TRADE MARK.

Ventilating Fan

The illustration shows a double inlet "Sirocco" Fan with a capacity of 270,000 cubic feet of air every 60 seconds at 5″ water gauge.

A "Sirocco" Fan will deliver twice as much air as the ordinary steel plate fan of the same wheel diameter. Save one-half the space and one-third the power.

"Sirocco" Fans and Blowers are made in sizes to deliver from 75 cubic feet per minute to 1,000,000 cubic feet per minute.

Our Engineering Department will gladly co-operate with you in the selection of the proper equipment for YOUR needs.

Let us tender on your next requirements. Bulletin No. 3401 is descriptive of the construction and operation of "Sirocco" Fans. You should have a copy.

CANADIAN Sirocco COMPANY
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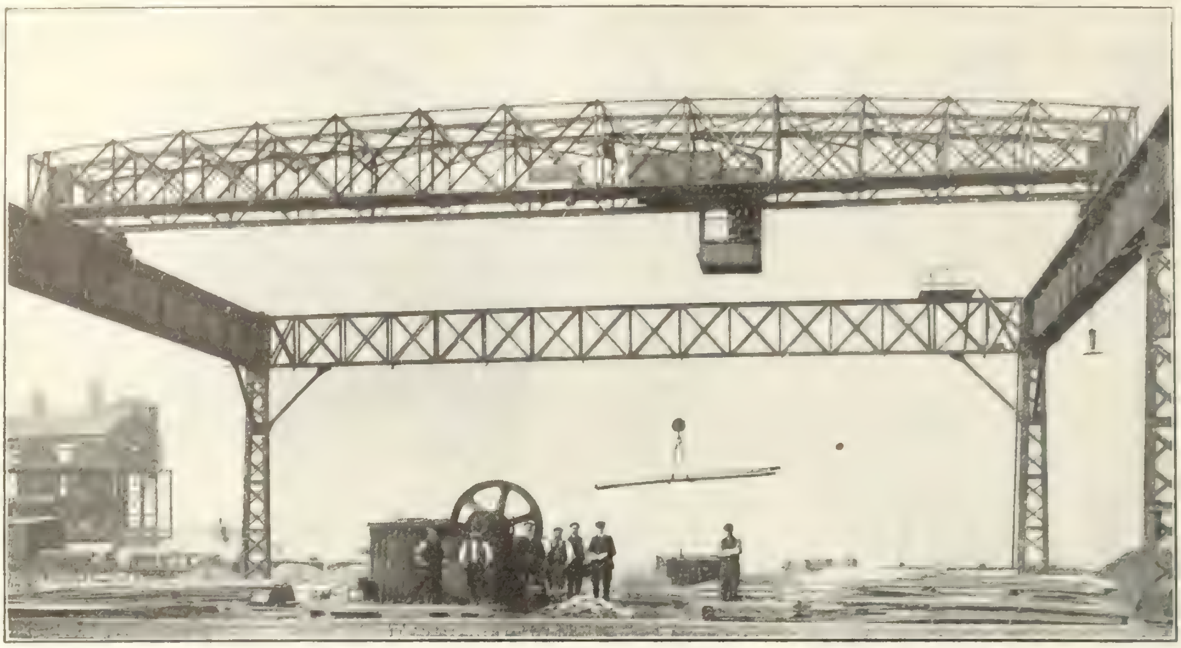
S. S. Clarke, 605 2nd St. West, Calgary



Yard Crane at Steel Mill of Sir Alfred Hickman, Limited, Bilston, Staffordshire

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Electrical
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Motors,
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YOUR ENQUIRIES ARE SOLICITED FOR

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ROYCE, LTD., Trafford Park, Manchester, England

Baker Armor Plates

Protect Your Concrete Pavement at its Weakest Point—the Expansion Joint

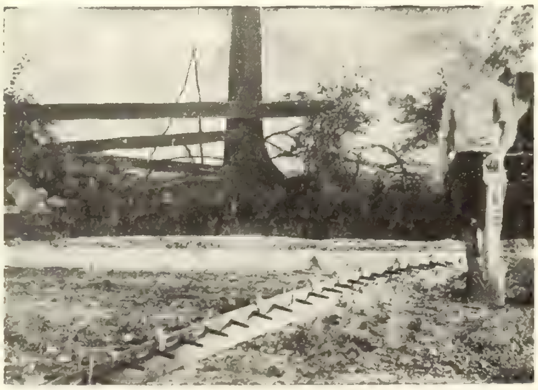
Wayne County's 70 Miles of Concrete Roads Prove that the Baker Plate Has Solved the Expansion Joint Problem.

"The only surface repair required on our concrete roads has been on the roads first constructed, where the joints were not protected with the 'armor' plates."

Extract from Sixth Annual Report of the Board of Country Road Commissioners, of Wayne County, Mich., Sept. 30th, 1912.

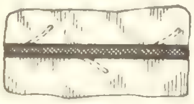
Our new system of installing Baker Armor Plates is simplicity itself, and holds the joint to perfect line and grade.

We guarantee Baker Armor Plates to be perfectly crowned as specified, and entirely free from defects of manufacture.

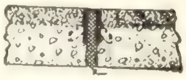


Send for This Book on Concrete Pavements

Our booklet on concrete pavements illustrates and describes pavements in many different cities, giving cost data and describing in detail the methods used. Complete specifications for the ideal concrete pavements are included as well as instructions for installing Baker plates. This booklet is sent without charge to responsible engineers contractors and highway officials.



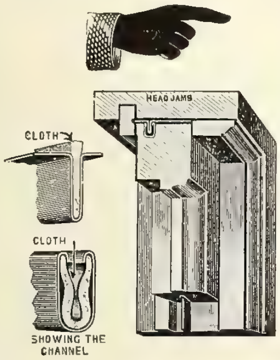
Longitudinal Section Showing Joint.



Cross-Section of Pavement Showing Expansion Joint.

R. D. BAKER CO., 73 Home Bank Bldg.
DETROIT, - MICH.

The ATHEY Cloth-lined Metal Weather Strip



THE only one that keeps out all draughts and dirt.

THE only one with a cloth-lined channel in the sash.

Installed by

The EBERHARD & WOOD Mfg. Co.
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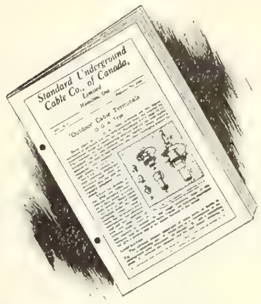
36-38 Lombard St. Phone Main 6338 **TORONTO**

N.B. Can be installed on Steel Casements of any type.



For Your Information

we have just issued our new Bulletin on Outdoor Cable Terminals. It describes and gives voltages, dimensions, weights, etc., of the following styles of terminals:

Terminals for Light, Power and Railway Service
Single Conductor Terminals
Multi-Conductor Terminals.
Multi-Unit Terminals

Terminals for Special Service
Inverted Terminals
Series Arc Terminals
Small Telegraph Terminals
Borehole Terminals
Mine Shaft Terminals
Pipe-top Terminals
Panama Canal Type Terminals

It also gives instructions for ordering and installing, etc. If you use cable terminals you should have this new bulletin.

Write our nearest office for Bulletin No. 700-1C.

Standard Underground Cable Co. of Canada, Limited.

Montreal, Que.
Boston, Mass.
Hamilton, Ontario
Winnipeg, Man.
Seattle, Wash.

Architectural
Terra Cotta

Supplied by

Gibbs & Canning, Limited
Tamworth - England

from Best Staffordshire Clay.
Works established over half a Century.
All Colors with plain or dragged surface or with Matt Glaze.
For further information, samples and estimates, enquire of the following agents—

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J. J. Laferme, 44 Beaver Hall Hill
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Scott, Hammond & Pratt, Limited, 65 Victoria Street
WINNIPEG
Barker & North, 26 Princess Street

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Hard Wall Plaster

HARD-WALL PLASTER
HAMMER BRAND
HILLSBOROUGH, N.B.

It neither loosens nor falls off, it allows carpenters to follow plasterers without loss of time and lasts as long as the building.

Albert Manufacturing Co.
Hillsborough, New Brunswick, Canada

Built With
Hamilton Pressed Brick

Built of the popular Hamilton Red Pressed Brick

Popular, because its deep uniform red shade is always the same and never fades.

Hamilton Pressed Brick is made from shale, rich in ironoxide and free from so called soda.

It has been used in many of the leading public buildings, schools and residences throughout Canada.

Send us your next order.

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Phone M. 5099

"BEATTY" HOISTS

Contractors who buy numbers of Hoists usually have to be convinced that what they are getting is "O. K."

The closer they examine and watch Beatty Hoists under severest conditions — the better pleased they are.

Their use spells Satisfaction.

The reason? The material, design and workmanship "are there."

We are building for the future—both yours and our own.

If you place one Beatty Hoist on your work, you'll eventually buy more.

Will gladly send full particulars and catalog.

Dipper Dredges
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All carry our equipment in stock.

NATIONAL PIPE & FOUNDRY CO., LIMITED

WATER WORKS CONTRACTORS

MANUFACTURERS OF

WOODEN WATER PIPE

For water works systems, domestic water supply and hydraulic mining. Insulated wire conduits; steam pipe casings; acid-proof pipe for mines, tanneries and pulp mills. Sizes from 2 inches to 24 inches.

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802 McGILL BUILDING, MONTREAL Works: ALEXANDRIA, ONT.

Wm. P. McNeil & Co., Ltd.

New Glasgow, Nova Scotia

Beg to announce that owing to the development of their business in the past and following the plans for developments recently inaugurated, hereafter their business will be carried on under the name of

The Maritime Bridge Company, Limited

No change in the Executive is contemplated, this being merely a change in name. Trusting to be still favoured with your valued patronage as in the past,

We are, yours faithfully,

Wm. P. McNeil & Co., Ltd.

EXECUTIVE:
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Walter McNeil, President
Kenower W. Bash, Vice-Pres. and Manager
Robert C. Grant, Secretary

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Spadina Avenue Dock
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Water Washed Sand
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Screened Gravel
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Crushed Limestone
Crushed Granite

OUR plants at AYR and TORONTO are the most modern in the country and our materials are the best that can be produced.

Call Adel. 1947 and we will be pleased to give you all information regarding prices and deliveries.

JAMES THOMSON, President. J. G. ALLAN Vice-President. JAMES A. THOMSON, Secretary.

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Manufacturers

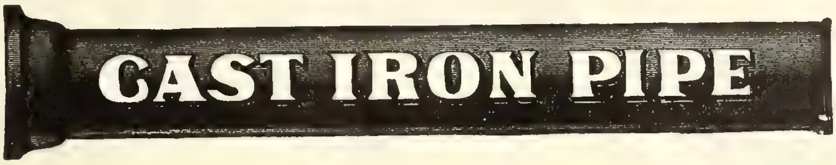
Flexible and Flange Pipe, Special Castings and all kinds of Waterworks Supplies.

3 inches to 60 inches diameter

for Water, Gas, Culvert and Sewer

HAMILTON, ONT.

The Canada Iron Corporation, Limited



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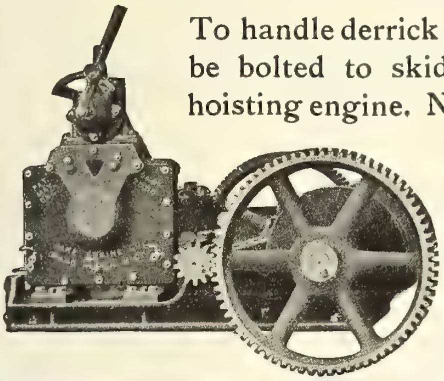
MONTREAL

Iron Ore, Pig Iron, Car Wheels, Cast Iron Water and Gas Pipe, Specials, Valves, Hydrants, etc., Castings of all kinds, Mooring Bollards for both Concrete and Wooden Docks, Hoisting Machinery.

The Dake Swinging Gear

To handle derrick booms. Can be bolted to skids in front of hoisting engine. No dead center.



Start, Stop, Reverse at Will

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Dake Engine Co.
Grand Haven, Mich.

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"Queenston Blue" Limestone

Send us your specifications for Cut Stone work

The Queenston Quarry Co., Ltd.
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The Ready Mixed
Hard Wall Plaster

Manufactured by

Alex. Bremner
Limited
100 Bleury Street - - MONTREAL

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Conduits

for Interior Construction

Conduits Company, Limited
Sole Manufacturers under Canadian and U. S. Letters Patent
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NATIONAL IRON WORKS, Limited

LARGEST MANUFACTURERS IN CANADA OF

every size for Water, Gas, Culvert or Sewer, Carried in Stock

Lake or Rail Shipments Offices, Works and Docks, TORONTO

"EBANO" and "EAGLE" Brands

MEXICAN ASPHALT

HERKIMER ST., HAMILTON. Paved with our Mexican Asphalt.

Write for analysis and samples

The
Asphalt & Supply Company, Limited

Sole Canadian Agents for the Mexican Eagle Oil Co.
Also Agents for MASTIC ASPHALT for Sidewalks.

428 Transportation Bldg., MONTREAL

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Lime, Stone, Cement,
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&c.

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OWEN SOUND
CRUSHED STONE

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This is a good example of Meadows stair work. Our plant is complete for the successful manufacture of this particular class of work. Specifications can be followed or we will submit designs.

Careful attention to details and thorough workmanship have made Meadows' stair work popular.

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Toronto Wire, Iron and Brass Works Co., Limited
Meadow's Block, Wellington St. W.
TORONTO, ONT.

460 feet x 8 feet 2 in.

World's Largest Chimney

Radial Brick chimneys are the only type that will not deteriorate from the effects of gases and erosion.

HEINICKE CHIMNEYS

will be found proving their superiority to over 4,000 users in every part of the country. The day of common brick and metal stacks is gone—if you are building a chimney make it a HEINICKE.

Write for catalogue

H. R. HEINICKE, INC. New York, U. S. A.

Representatives for Canada:
Black Building Supply Co,, Ltd. Toronto
Dartnell Ltd., Montreal Que.

Current Prices of Building Material

BRICKS

The following are wholesale prices delivered at Toronto:—

	Per M.
No. 1 dry pressed red brick	$18 00
No. 1 dry pressed buff brick	18 00
Red Stock Bricks	13 00
Grey Stock Bricks	13 00
Wire cut bricks for foundation work ...	12 50
Porous terra cotta bricks	15 00
No. 1 enamelled bricks, all colors, from ... ... $80 00 to	$150 00
Sand-Lime Bricks	11 00

LUMBER (Building Material)

Hemlock Lumber—		
2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$26 00	
2 x 4 to 2 x 12, 16 ft.	26 00	
2 x 4 to 2 x 12, 18 ft.	29 00	
1 in. Hemlock, No. 1	25 00	27 00
No. 1 Hemlock Decking	25 00	27 00
No. 2 Hemlock dimension and 1-in.	19 00	21 00
Pine—		
1 in. common pine 8 to 12 in. wide rough	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
⅞ x 8 and 10 in. pine shelving..	36 00	42 00
⅞ x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine decking D2S	30 00	
Spruce Decking	28 00	
No. 1 pine V. or headed sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	
Pine trim for paint finish—		
4 in. casing per 100 ft.	2 00	
5 in. casing per 100 ft.	2 50	
8-in. pine base, per 100 ft.	3 50	
10 in. pine base, per 100 ft.	4 50	
4 in. pine window stool	2 75	
Shingles—		
XXX B. C. Clear Shingles, per M.	3 90	
N. B. Extras	3 75	
N. B. Clears	3 10	
No. 1 pine lath, per M.	5 00	
No. 2 pine lath	4 50	
No. 1 spruce lath	4 00	
Cedar Posts—Fence—		
5 in. at small end, each	30	
7 in. at small end, each	35	
Hemlock lath	3 50	
Dimension Timber up to 32 feet:		
8x8, 10x10, 10x12, 12x12, 12x14		32 00
8x10, 8x12, 10x14, 14x14		34 50
8x14, 12x16, 14x16, 16x16		34 50
10x16, 14x18, 16x18		35 50
8x16, 12x18, 18x18		36 00
10x18, 14x20, 16x20		36 50
8x18, 12x20, 18x20		37 00
10x20		37 50
8x20, 14x22, 16x22, 18x22, 20x22, 22x22		38 50
12x22		39 00
10x22		39 50
8x22, 14x24, 18x24, 20x24, 22x24, 24x24		40 50
12x24		41 00
10x24		41 50
8x24		43 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

	Star	D.D.
10 to 25 united inches	$4 25	$ 6 25
26 to 40 "	4 60	6 75
41 to 50 "	5 10	7 50
51 to 60 "	5 35	8 50
61 to 70 "	5 75	9 75
71 to 80 "	6 25	11 00
81 to 85 "	7 00	12 50
86 to 90 "		15 00
91 to 95 "		17 50
96 to 100 "		20 50
101 to 105 "		24 00
106 to 110 "		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for box lots:—

MONTREAL

	Star	D.D.
25	$3 25	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
90		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 u.i.	$3 50	$5 00
26/40	3 75	5 50
41/50	4 25	6 25
51/60	4 75	7 00
61/70		8 00
71/80		9 00
81/85		10 00
86/90		11 00
91/95		13 00
96/100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

STEAM FITTERS' AND PLUMBERS' SUPPLIES

Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent.; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock	net$1.85
No. 4½ Fuller's	net$2.50

Square head brass cocks, 65 per cent.

Lead Pipe

Lead pipe, $7.50; less 5 per cent.; lead waste, $9.00, less 5 per cent.; caulking lead, 7 cents per lb.; traps and bends, 40 per cent.; pig lead, 5¾ cents per lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.28	¼ inch	$3.18
⅜ "	2.28	⅜ "	3.18
½ "	2.72	½ "	3.57
¾ "	3.28	¾ "	4.43
1 "	4.85	1 "	6.55
1¼ "	6.56	1¼ "	8.86
1½ "	7.84	1½ "	10.59
2 "	10.55	2 "	14.25
2½ "	16.67	2½ "	22.52
3 "	21.80	3 "	29.45

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

Soil Pipe and Fittings

Medium and extra heavy pipe and fittings, up to 6-inch, 60 and 5 per cent.

7 and 8-inch pipe, 45 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

CEMENT, STONE, STEEL, Etc.

Cement, barrel lots, in bags, delivered, Toronto, bags, extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ⅜-inch, $1.45.

Burnt River rubble stone delivered, $17 to $18 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¾ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

Free stone delivered, $17 to $18 per toise.

Brown coursing stone, delivered, $3.75 per yard.

Grey coursing stone, delivered, $2.50 to $2.75 per yard.

Sand, for cement or brick work, $1.15 a cubic yard, f.o.b. Toronto, C. P. R. siding.

Sand, for cement or brick work, 90c to $1.05 a cubic yard, f.o.b. Toronto, G. T. R. sidings.

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

Steel channels and beams, angles and plates, $2.65 to $3.00 per 100 pounds, delivered f.o.b. Toronto.

Hard Wall Plaster, unsanded, from $7.00 to $8.50, bags extra; sanded, $4.00 in car lots; hydrated lime, $10.00 in car lots.

Lime per cwt., delivered, not less than 1,500 lbs. 33 cents; white, 43 cents.

Plaster of Paris, Anchor and Crown Brands, $1.50.

Manilla Rope, best, per pound, 12½ cents.

PAINTS AND OILS

Pure White Lead, ground in oil, $8.40 per 100 lbs.

Boiled Linseed Oil in bbls., 67c per gal of 9 lbs.

Raw Linseed Oil, in bbls., 64c per gallon.

Pure Red Lead, dry, $7.00 to $8.00 per 100 lbs.

Putty, pure linseed oil, in bulk, bbls., 3½c.

Putty, pure linseed oil, in 25-lb. tins, 4c.

Gravity System Distributing Concrete

Gravity System Equipment on Large Concrete Building

A system that improves the concrete and reduces the cost.

Information gladly furnished and estimates given on any work.

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STRUCTURAL STEEL FOR QUICK DELIVERY

We carry in stock at Montreal, 5,000 tons of Structural Shapes and are in a position to make quick shipment of either plain or riveted material for

Bridges, Roof Trusses, Columns, Girders, Beams, Towers and Tanks, Penstock.

Estimates furnished promptly. Capacity 18,000 Tons Annually.

Structural Steel Co., Ltd.
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Engines and Boilers

of all types and sizes, Heaters, Tanks, Pumps, etc.

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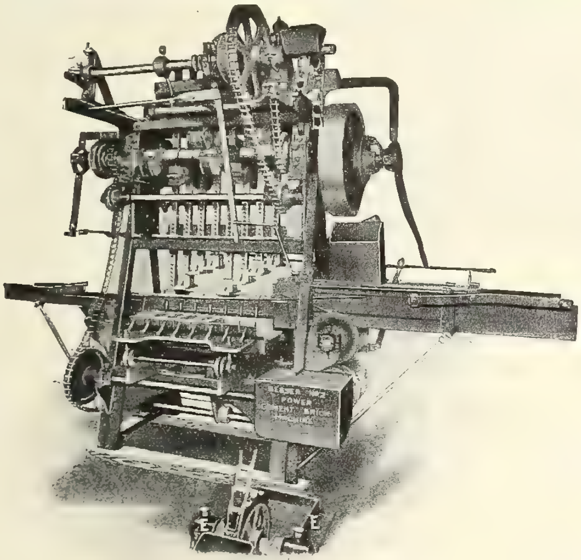
AGENTS:

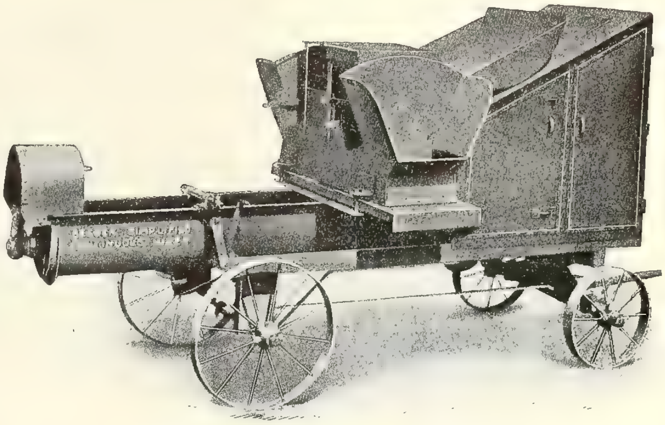
MONTREAL ST. JOHN, N. B. WINNIPEG CALGARY VANCOUVER

Cement Bricks

Here are the two Besser machines that make the best cement brick on the market. The Brick machine that will make 30,000 bricks per day—every brick the same.



Besser Power Cement Brick Machine



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Woodstock Wind-Motor Co., Ltd.
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HALIFAX, N. S. " " " "

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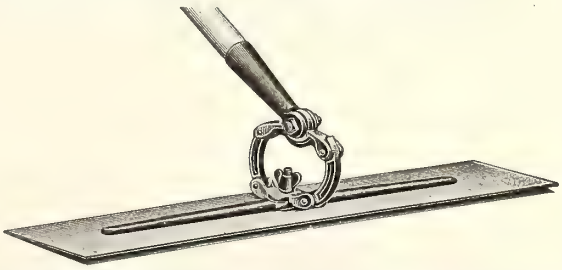
Hardens with Age. Low Price. Samples and Quotations Free



"Abram" Sidewalk Finishing Tools are sold on the **Guarantee** that **ONE MAN** can do more work with them than **THREE MEN** can do with ordinary tools. This means, if Finishers get $4.00 per day, you save the wages of **TWO MEN**, or $8.00 per day, by using **"Abram"** Tools. We positively guarantee this result. Let us prove it to you. Circular.

ABRAM CEMENT TOOL CO. 105 Ouellette Ave. WINDSOR, ONT.

Crushed Stone, Limited

STONE of any Size and in any Quantity on hand for Sidewalks, Roadwork or Concrete Work

Works: Kirkfield, Ont.
Head Office: 47 Yonge St. Arcade, TORONTO
Phone Main 4516
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Trinidad Liquid Asphalt

A Permanent Constructive Agent for Good Roads

A Trinidad Asphalt Road

It is necessary to screen a Trinidad Liquid Asphalt road only once — and that is when it is built.

The reason why this is so is that Trinidad Liquid Asphalt **stays in the road.** It does not bleed. It incorporates so perfectly and so everlastingly with the fine mineral particles of a road surface that there is no exudation of asphalt and no greasy dust on roads constructed with **Trinidad Liquid Asphalt.**

Most oiled-road troubles are due to the paraffine in the oil applied. Trinidad Liquid Asphalt contains no paraffine whatever.

Engineers, road builders and road users who want to know why some bituminous roads "bleed" and give off oil-ladened dust, while other roads are free from these defects, can find out all about it in the Trinidad Liquid Asphalt booklets that will be sent free for the asking.

Trinidad Liquid Asphalt—A. for use cold. Not only prevents dust but forms a waterproof surface for macadam and dirt roads.

Trinidad Liquid Asphalt—B. for use hot. Constructs an inexpensive lasting surface for roads, forming a true asphaltic surface coat, which holds the road together and prevents dust.

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Philadelphia, Penn.

Cap. 75000 gals. Height 85-ft.
Canadian Car and Foundry Co., Montreal

Canadian Plant

Chicago Bridge & Iron Works

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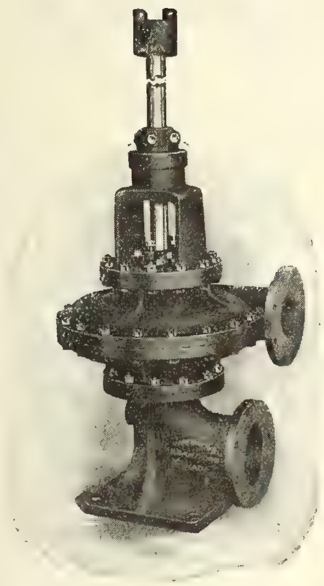

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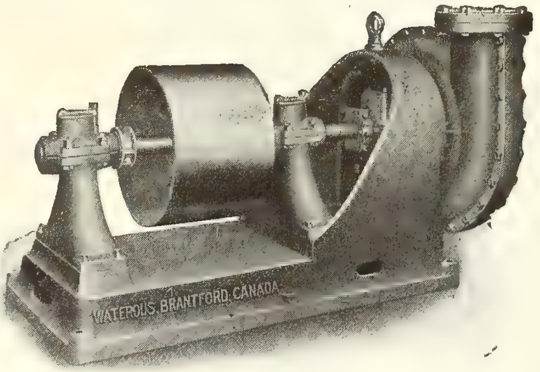

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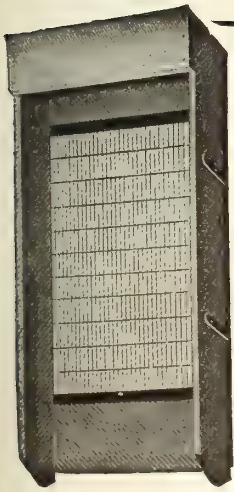

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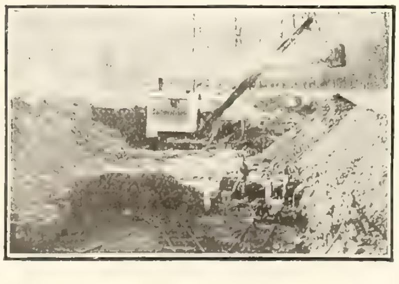

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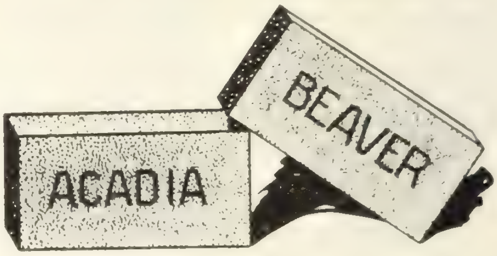

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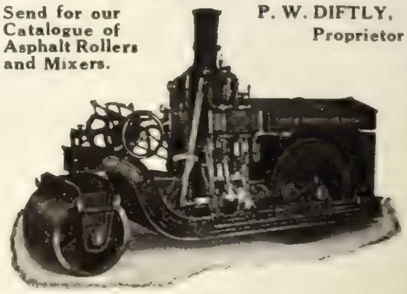

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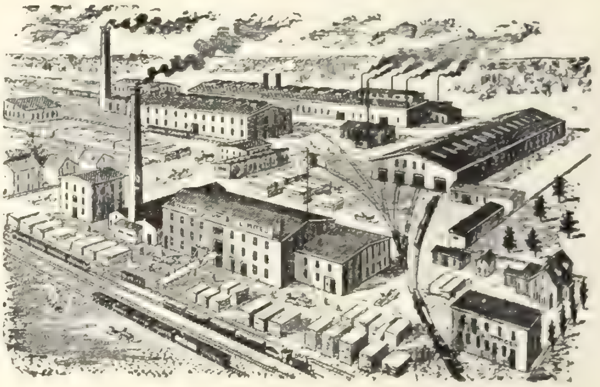

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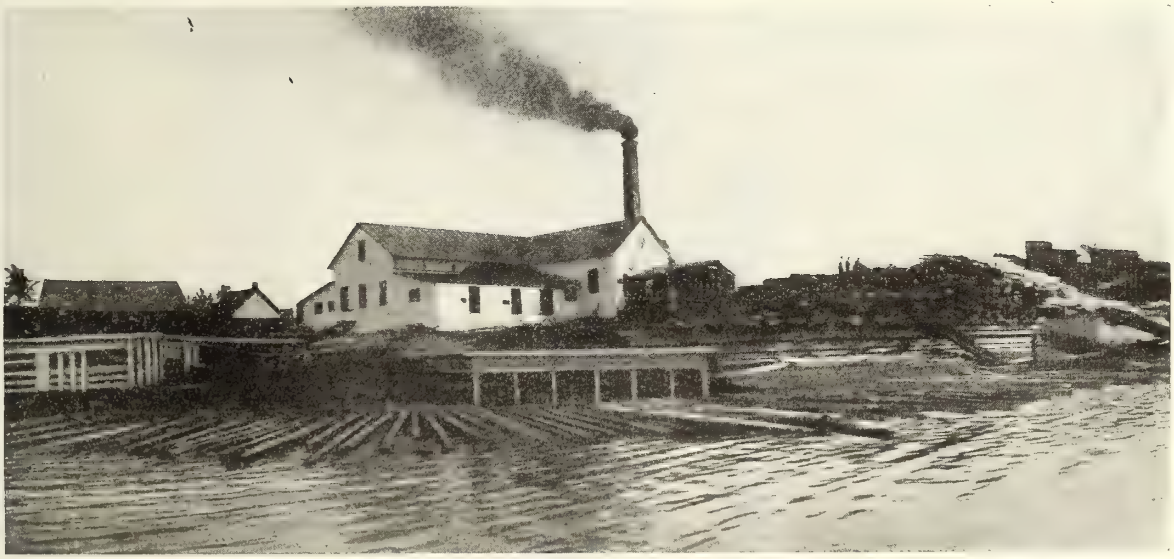

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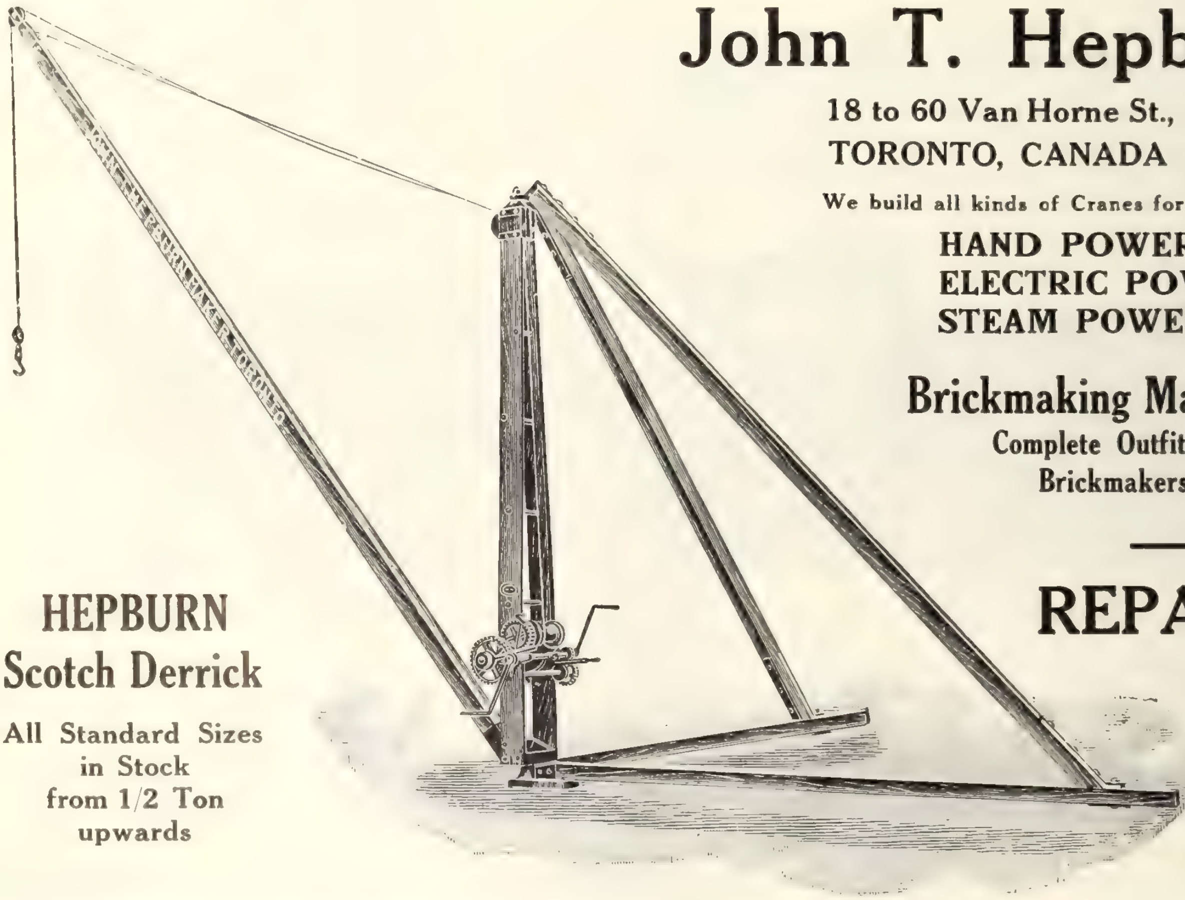

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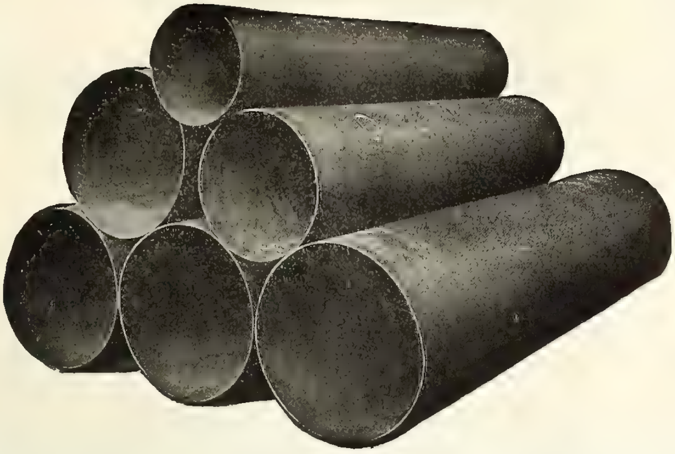

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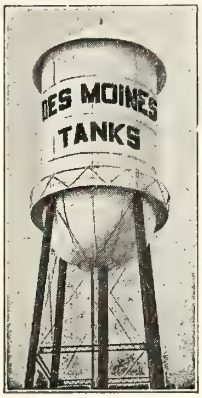

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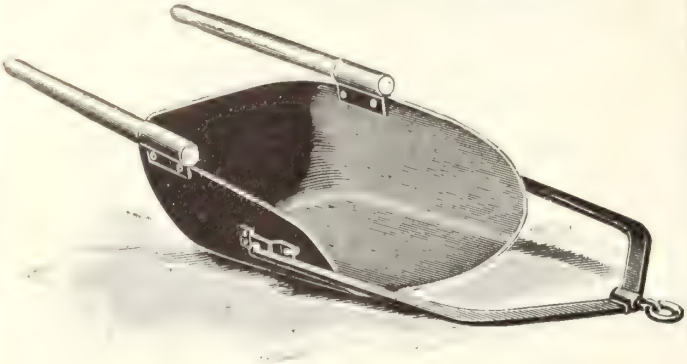

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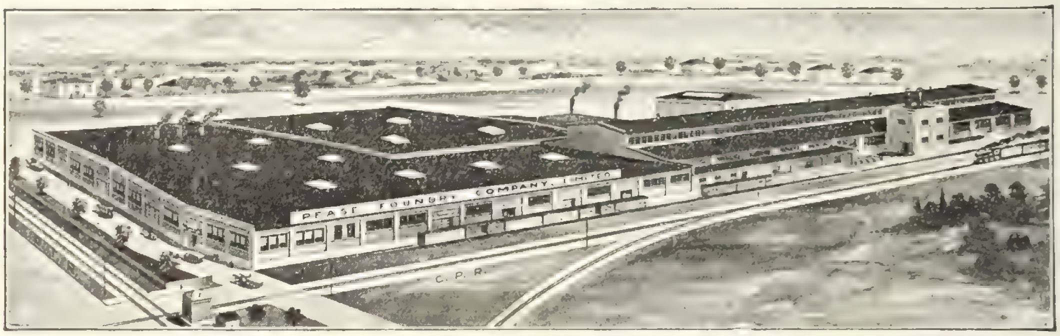

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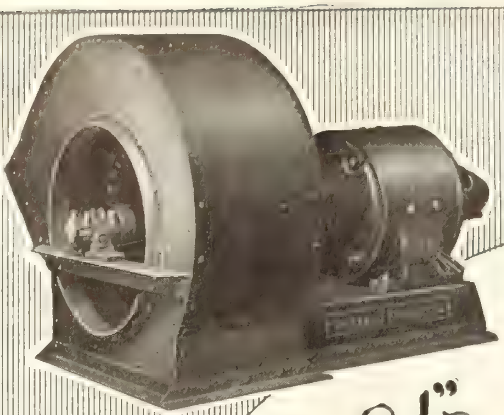

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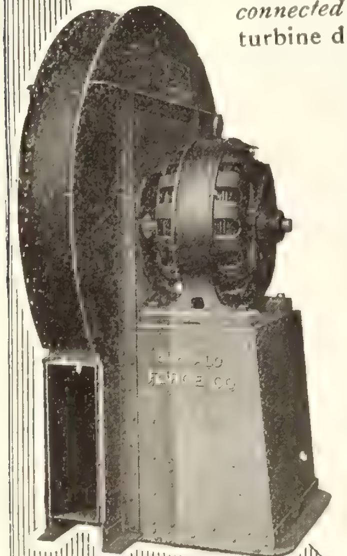
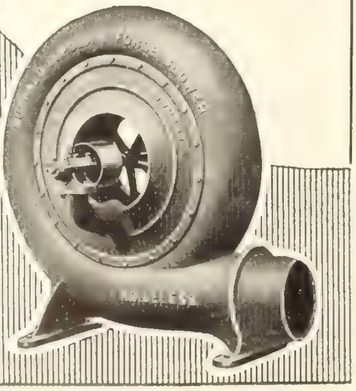




Structural Water-proofing

"DEHYDRATINE"

For Water-proofing under the membranous method.

"HYDRATITE"

For Water-proofing Concrete.

"FERRO FAX"

For Surface Hardening Concrete Floors.

"SYMENTREX"

A Cement Coating—Makes Surfaces Water Shedding.

MADE IN COLORS

"These Trade Names protect you against the possible selection of inferior materials. Whether you prefer a water-proof paint or a compound, we can give you satisfactory assurance as to the reliability of these products."

"FOR 15 YEARS STANDARD OF THEIR KIND."

Pinchin-Johnson & Co.
(Canada) Limited
Minerva House, - Toronto

Write for Particulars and Architect's Hand Book (1913 edition)

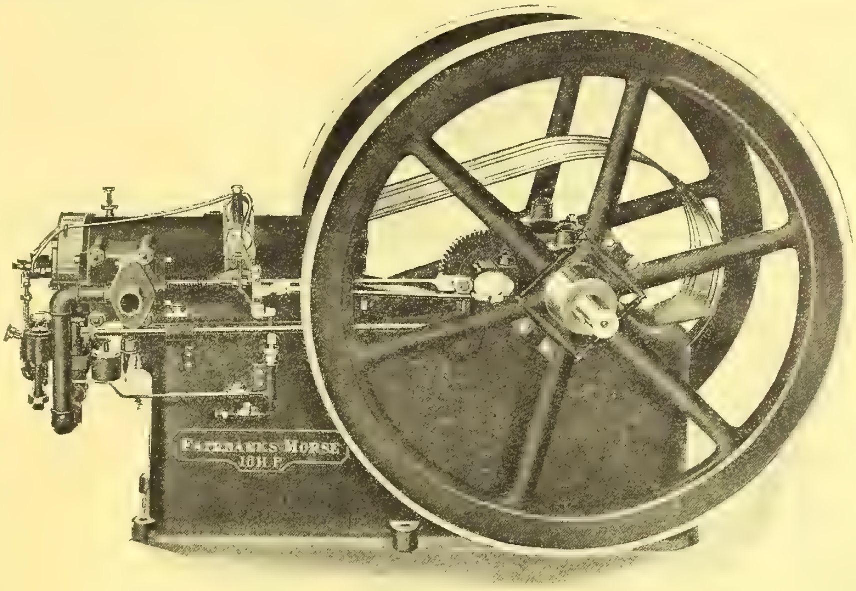
AGENCIES IN ALL CITIES

Advantages of the Oil Engine

As gasoline is steadily rising in price, the cost of operating a gas engine is becoming a serious problem. You do not have to use gasoline, however. You can use oil and greatly reduce your power cost.

Fairbanks-Morse Oil Engines will operate successfully on 72 per cent. of the oils distilled from the average crude.

Aside from its low fuel cost, the oil engine has many striking advantages over any other type of engine. It is the ideal engine for contractors and mining service, because of its portability; cleanliness; automatic operation, requiring no skilled attendants; no expense when not running; no water required except for the cooling tank; absolute safety, no danger from fire, and thorough reliability. Our oil engines are equipped with the famous Bosch Magneto. The type shown here is made in sizes of from 8 h.p. to 25 h.p. We build oil engines in all the common sizes of from 2 h.p. up to 200 h.p. Ask for catalogue 52.



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Across Canada with the

Imperial Wire & Cable Company, Limited

Toronto MONTREAL Winnipeg

Third of a series of advertisements showing buildings of national importance which have been wired with Imperial Wire and Cable Co's. Limited, wires.

This picture shows

THE McARTHUR BUILDING, WINNIPEG

This building was wired with "30% PARA" Rubber Insulated Wire.

Architect; J. H. G. Russell, Winnipeg
Engineer; Charles L. Pillsbury, Minneapolis, Minn.
Electrical Contractors; Mitchell-Gray, Electric Co., Winnipeg.

Address enquiries to nearest office

MONTREAL TORONTO WINNIPEG

Enquiries from Alberta and British Columbia may be addressed to Northern Electric & Manufacturing Co., Ltd. Calgary and Vancouver.

"ADANAC" "IMPERIAL HIGRADE" and "30% PARA"

A Catalogue—

Every Builder and Contractor should have.

Have you received
your copy of
K. & J. Catalogue
No. 38?

THE
KILBOURNE & JACOBS
MFG. CO.
COLUMBUS, OHIO, U.S.A.
Catalog No. 38
SHOWING
DRAG AND WHEEL SCRAPERS
WHEELBARROWS
CONTRACTORS PLOWS AND CARTS

Have you received
your copy of
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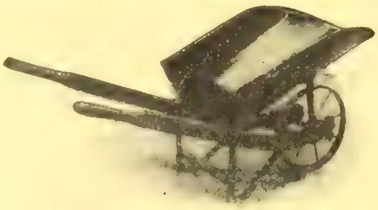
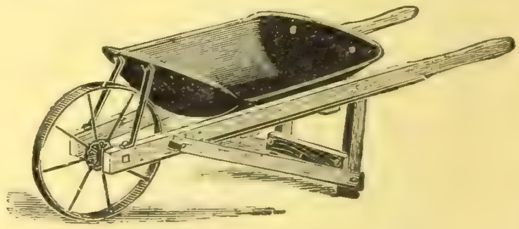
No. 38?

This New No. 38 Kilbourne & Jacobs' Catalogue illustrates and describes fully every style of barrow, wheel or drag scraper and plows. You may require equipment of this description—perhaps not at the moment but later on. This book will surely be of assistance to you as you can select the proper style of barrow, etc., for your requirements. Let us send you a copy—free for the asking.



"Kilbourne & Jacobs"
Wheel
Barrows

All styles in
stock



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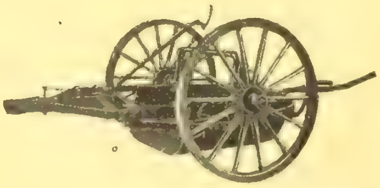

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MONTREAL

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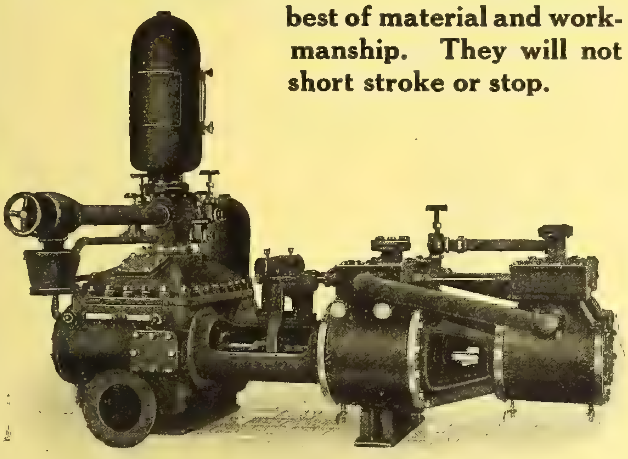
Vol. 27 Toronto, September 24, 1913 No. 39

ESTABLISHED 1886

Contract Record and Engineering Review

We manufacture all kinds of Steam and Power Pumps for all kinds of services, using only the best of material and workmanship. They will not short stroke or stop.



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HAMILTON, CANADA

"MADE IN CANADA"

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Made in all Kinds of Glass on Short Notice

Large Bent Plate Glass for Shop Fronts a Specialty

The Toronto Plate Glass Importing Company, Limited
(HILL & RUTHERFORD, Managing Directors)
Head Office and Works: 91 to 133 Don Roadway
TORONTO

Air Compressors
OF BELLISS MAKE
have gained their reputation for

- Simplicity of Design
- Noiseless Running
- Compact Design
- Low Oil Consumption
- Continuous Operation
- Overall Efficiency

Messrs. Belliss & Morcom, Ltd.
BIRMINGHAM, ENGLAND
Agents
Laurie & Lamb
Board of Trade Building, MONTREAL

Continuous and Machine Banded Wood Stave

WATER PIPE

RESERVOIR TANKS

for city and town Water Systems, Fire Protection, Power Plants, Hydraulic Mining, Irrigation, etc. One-half the cost of Iron Pipe—and better.

Pacific Coast Pipe Co., Limited
P. O. Box 563 Vancouver, B. C.
Office and Factory, Granville St., near High Bridge
WRITE FOR CATALOGUE
Full Particulars and Estimates Furnished

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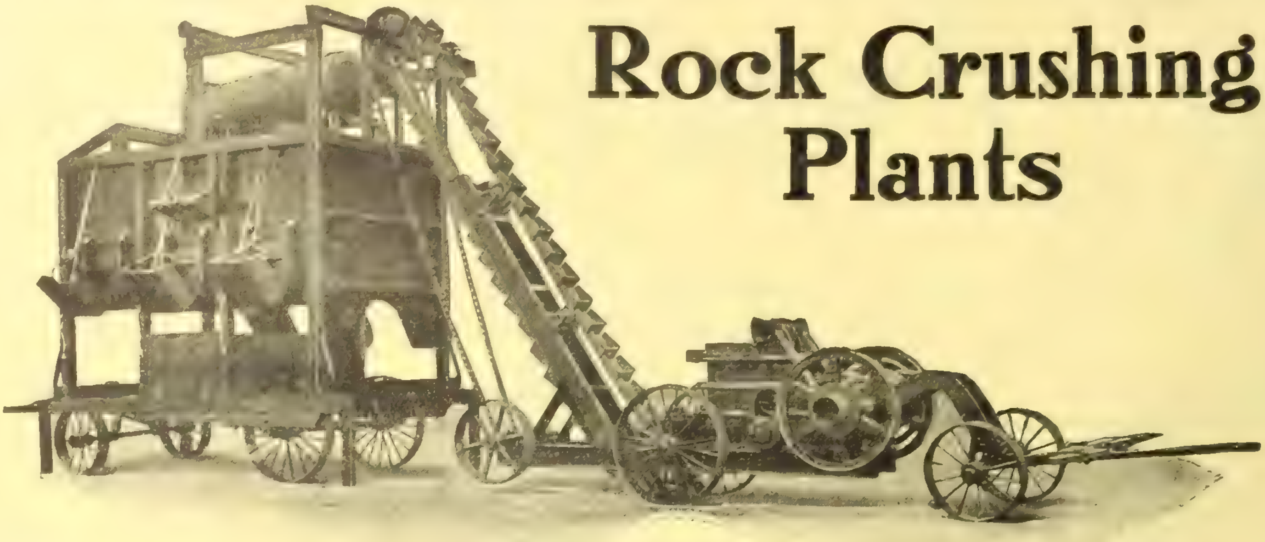

Rock Crushing Plants

Complete, Self-contained, Portable, Crushing, Grading and Loading Plant

The adaptability of the above plant, the ease with which it can "follow the job" makes it an ideal outfit for the the Contractor. It is only one of our many combination machines for crusher work.

Full details of the various parts will be gladly furnished by any of our offices.

THE JENCKES MACHINE COMPANY, LIMITED

Sherbrooke St. Catharines Montreal Cobalt South Porcupine Vancouver Nelson

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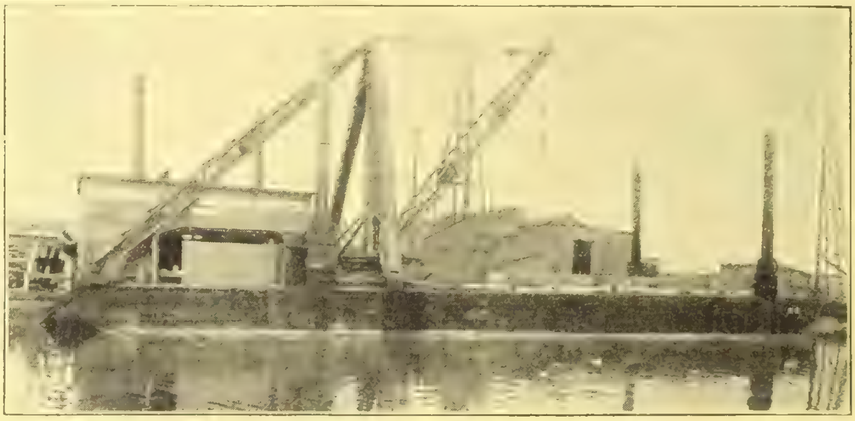

Here Is One of The Most Powerful Steel Barge Derricks Ever Built

It's an "AMERICAN," of course.
50 tons is its nominal capacity.

This great barge derrick was built for the G. H. Starke Dredge and Dock Co., of Milwaukee, and is a convincing testimonial to the skill of our engineers and the efficiency of our shops.

AMERICAN HOIST & DERRICK COMPANY,

ST. PAUL, MINN., U.S.A.

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Gorman, Clancey & Grindley, Edmonton, Alta., and Nelson, B.C.

Stuart Machinery Co., Winnipeg, Man.
Vancouver Machinery Depot, Vancouver, B.C.

CANADA Portland CEMENT

SOME men ask for so many bags of "cement"—

Others, more careful, say they want "Portland Cement"—

But the man who does the best work insists upon getting "Canada" Portland Cement—

And he looks to see that every bag bears this label

CANADA CEMENT COMPANY LIMITED
PORTLAND
CANADA
CEMENT
MONTREAL

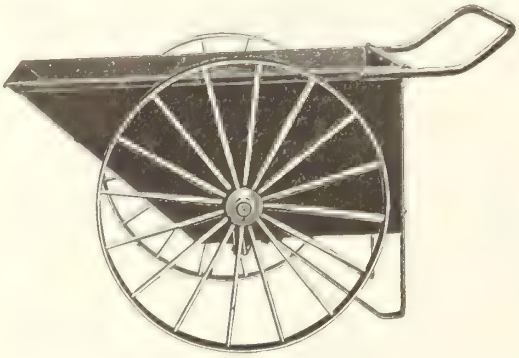
TO specify Canada Portland Cement is to introduce an additional safety factor into your calculations. Architects, contractors and engineers know the value of "making assurance doubly sure."

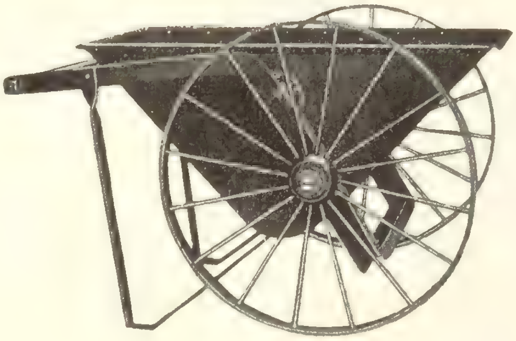
Canada Cement Company, Limited

Head Office - Montreal

Sales offices at

Montreal - Toronto - Calgary - Winnipeg





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AND

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In All Styles

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For All Purposes

Factory, Warehouse, and Railway Trucks

Write for new Barrow Catalogue just issued.

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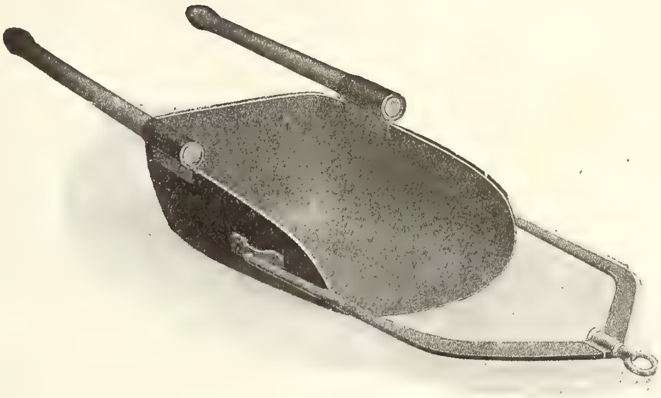

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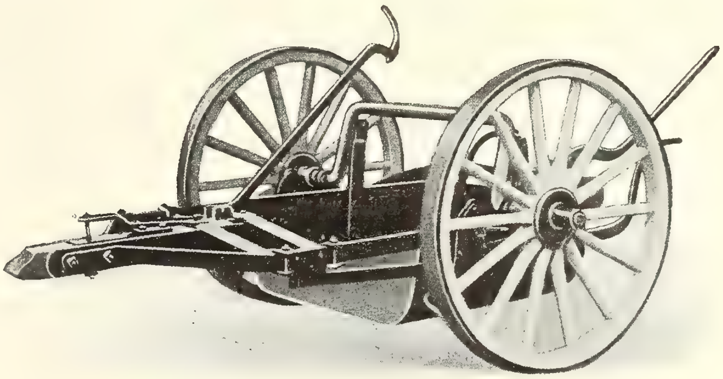
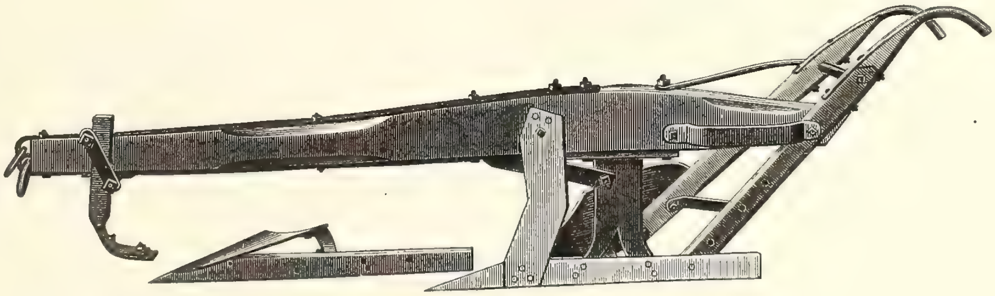


All made from the best materials available and embodying the latest improvements.

Investigate the
Meaford lines
before buying
your equipment



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Quebec, 71 Maple Ave.
St. John, N.B., 57 Smythe St.
Halifax, 78 Granville St.

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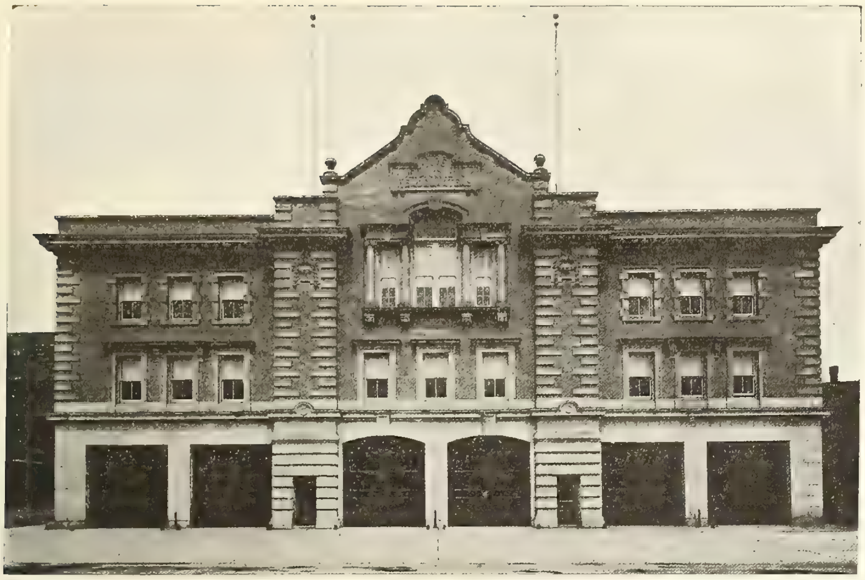


Headquarters, Fire Department, Adelaide St. West, Toronto

Don Valley Bricks

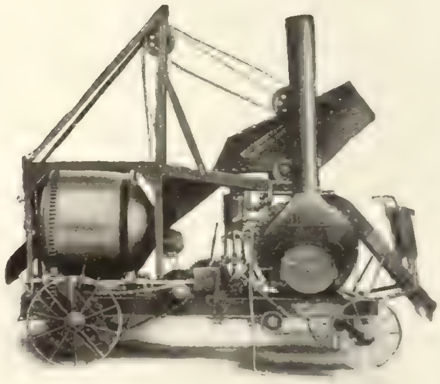
The above building erected under the supervision of Toronto's city architect is built of Don Valley Clay Products.

Don Valley Eaton Oriental Brick was used for the outer walls and the building is fireproofed throughout with Don Valley Porous Terra Cotta. The result is an imposing fireproof building that will look as fresh and clean cut in twenty years as it does today.

For pleasing and permanent effects in brickwork
Specify "Don Valley Brick."

Don Valley Brick Works

Toronto, Ontario



It's that
Heart-Shape Drum
That makes the mixer mix.

Wettlaufer Bros.

178 Spadina Ave., Toronto, Ont.

Factories: Mitchell, Ont., Buffalo, N.Y., Detroit, Mich.

AGENCIES:

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Crushed Stone

If you want crushed stone in a big hurry come to us and you will get it.

Our bins are always loaded to the top with stone of all grades and shipments can be made the day your order is received.

Quarries located at Dundas and Vinemount.

Portland Cement

Our several cement mills are located at various points that enable us to make prompt shipments with short hauls.

Send us your next order.

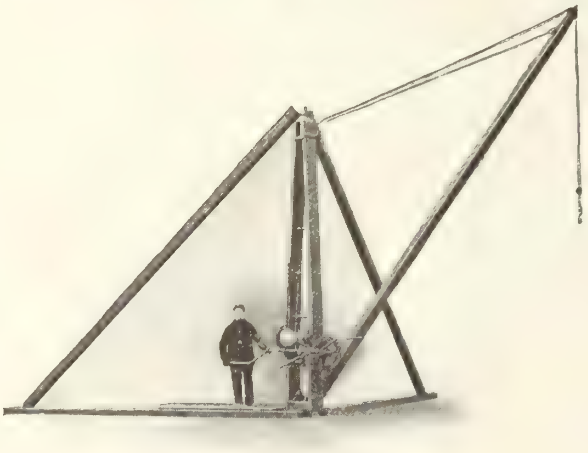
Alfred Rogers

Limited

28 King St. West, Toronto

Beath Scotch Derricks

Hand or Power



THE construction of Beath Scotch Derricks embodies several points of merit not found in other makes.

All stress parts are **steel** not cast iron. Bottom Pintle Bearing is of ball and socket type and works in a bath of oil, thus ensuring an easy movement at this joint.

Beath Derricks are provided with self-oiling bearings, ensuring easy operation and reducing wear to a minimum.

We also make Jinniwink Derricks, Stiff Leg Derricks, Guy Derricks, and Steel Derricks for heavy service. Hand or Power operated.

Send us your enquiries for Derricks

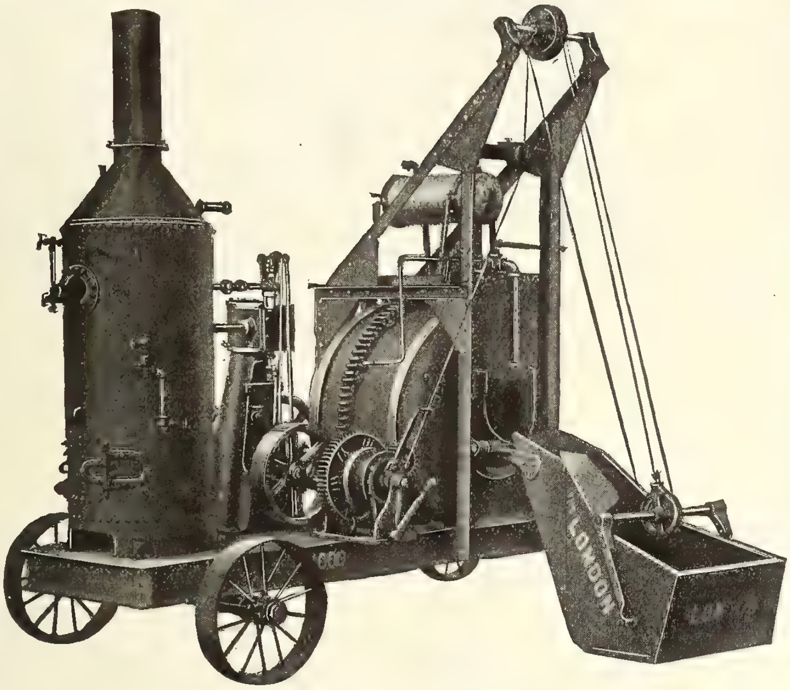
W. D. Beath & Son, Limited

ENGINEERS AND MANUFACTURERS

20-30 Cooper Ave., Toronto

The A. M. Ellicott Co., 301 St. James St., Montreal, Que., sole selling agents for Province of Que.

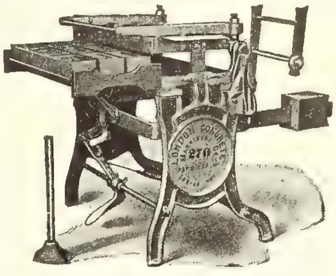
HAVE YOU SEEN OUR 180 PAGE CATALOGUE?



London Standard Drum Batch Mixer

Showing the largest line of Concrete Machinery ever crammed into a Catalogue.

All made in our own Factory and under a system producing an excellence of quality. Our large output right from Factory to the Contractor.



London Cement Brick Machine.

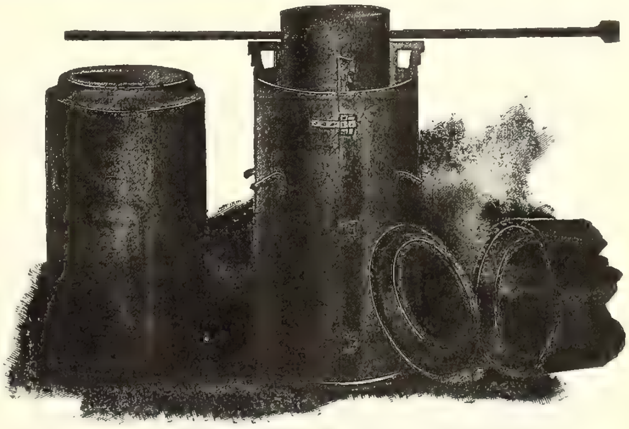
Even such remarkably low prices are preferable to exorbitant prices and small output.

Some people wonder how we can sell high grade machinery at such low prices. **It is quite simple. Our Enormous Sales and Small Profits are sufficient explanation.**

We manufacture over twenty different sizes and styles of **Concrete Mixers, Mortar Mixers, Concrete Block Machines, Cement Brick Machines, Cement Tile Machines, Tile Moulds, Rock Crushers, Screens and Elevators.**

London Cement Block Machine.

- **Gasoline Engines**
- **Pumping Outfits**
- **Steam and Gasoline Hoists**
- **Material Elevators**
- **Sidewalk Forms**
- **Sidewalk Tile Machines**
- **Concrete Carts**
- **Wheel Barrows**



London Sewer Pipe and Tile Moulds.

Sill, Step and Widow-Cap Moulds

A Complete Line of Cement Working Tools.

London Concrete Machinery Co., Limited

Head Office and Factory: Cabell St. and Kitchener Ave., London, Ont.

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We are the Largest Manufacturers of Concrete Machinery in Canada.

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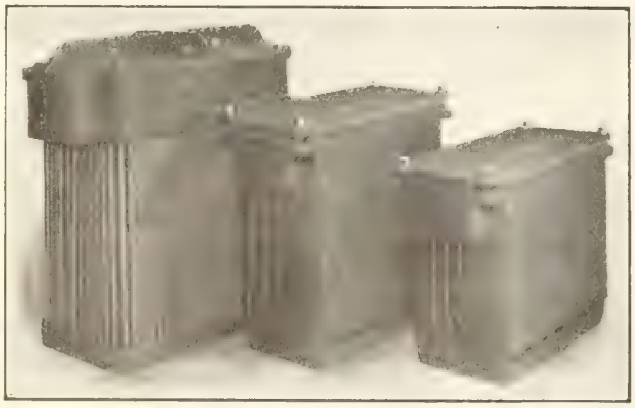
Reduced Loss
Increased Profit

Ferranti
Transformers



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The Transmission line that is equipped with Ferranti three phase transformers is always a profitable one because of the great reduction in energy-loss made possible by these efficient transformers.

All coils are wound with copper of ample sectional area, thereby reducing copper losses to a minimum.

Three phase transformers are the most economical type to operate and will effect a considerable saving in construction cost.

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The Ferranti Electrical Co., of Canada, Limited

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Built of Sydney Pressed Brick

IN this product you get a brick of such superior quality that a saving of one dollar a thousand can be effected in the laying of the bricks as compared with ordinary irregular brick.

The mortar adheres with great strength to "Sydney" pressed brick and they harden with age.

Prices and Particulars on request.

Sydney Pressed Brick Co.

Limited

Sydney, Nova Scotia

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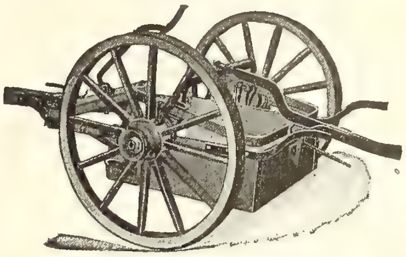

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The Westerns are noted for their capacity, light draft, simplicity and durability. They will shortly pay for themselves, and be paying you a handsome dividend on your investment.

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Hagersville Crushed Stone

The Toughest Stone for Macadam in Ontario

Record of Logan Avenue, Toronto, Macadamized from Queen St. to Gerrard St., in 1902

Length 2,454 Lin. Ft. Width 24 Lin. Ft. 6,550 Sq. Yds.

COST FOR REPAIRS	1903	$ 0.00	1908	$ 93.26
	1904	3.30	1909	200.46
	1905	9.35	1910	14.07
	1906	37.33	1911	2.29
	1907	16.11		

Total $376.17 or 5⅔c. per sq. yd. for repairs for nine years, a little over 6-10 of 1c. per sq. yd. per year.

Why Not Use Hagersville Stone and Get These Results?

Hagersville Contracting Co.

Hagersville, Ont. **Limited**

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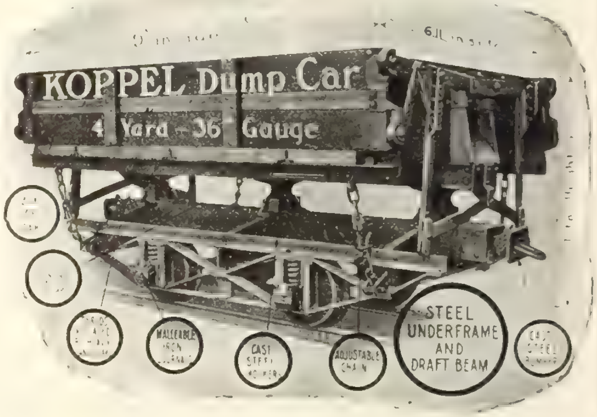
What Big Contractors

Say About This Koppel Car



Just to show you what contractors think of Koppel Cars, we quote below a letter from McMenamin & Sims, Contractors, of Philadelphia, Pa., referring to the type of car shown here:—

"The car was used here for hauling clay, gravel, and loose earth only. We find it is an excellent car, very much better than the average two way dump car. The car dumps very easily when loaded and returns to the upright position with ease. When dumped the material runs out freely and the bed in dumped position clears the dumped material very nicely.

In dumping any car we find that the initial lift requires the most men. This is greatly alleviated by the manner in which you have your bed supported on the truck. Our shovel engineers say it is a very easy car to load, as the bed is low, broad and long, thus obviating the necessity of getting the dipper so exactly above the center of the car."

This car is built for 36-inch gauge and will carry a heaping load of over 6 yards. It is designed for hand or air dump, and on account of the long side throw the material is dumped clear of the rails. Large quantities of these cars are kept in stock at Koppel, Pa.

Let us send you catalogue and specifications.

Orenstein-Arthur Koppel Co.

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Economy *and* Protection

THE fire standards for theatre buildings are especially rigid. It is significant, therefore, that a large number of theatres throughout the country carry Barrett Specification Roofs. These roofs take the base rate of insurance and are acceptable to fire underwriters everywhere.

Their cost is less than that of any other permanent roof covering; they require no expenditure whatever for maintenance and usually last about twenty years.

A Barret Specification Roof consists of five plies of tarred felt and pitch with a top covering of slag, gravel or tile. Being one continuous sheet with no laps or seams it blankets the flames in case of fire and will last until the supports beneath are entirely destroyed. From the standpoint of both economy and protection, such roofs should be used on all permanent buildings.

A copy of the Barret Specification with tracing ready for incorporation into your building plans sent free on request. Address nearest office.

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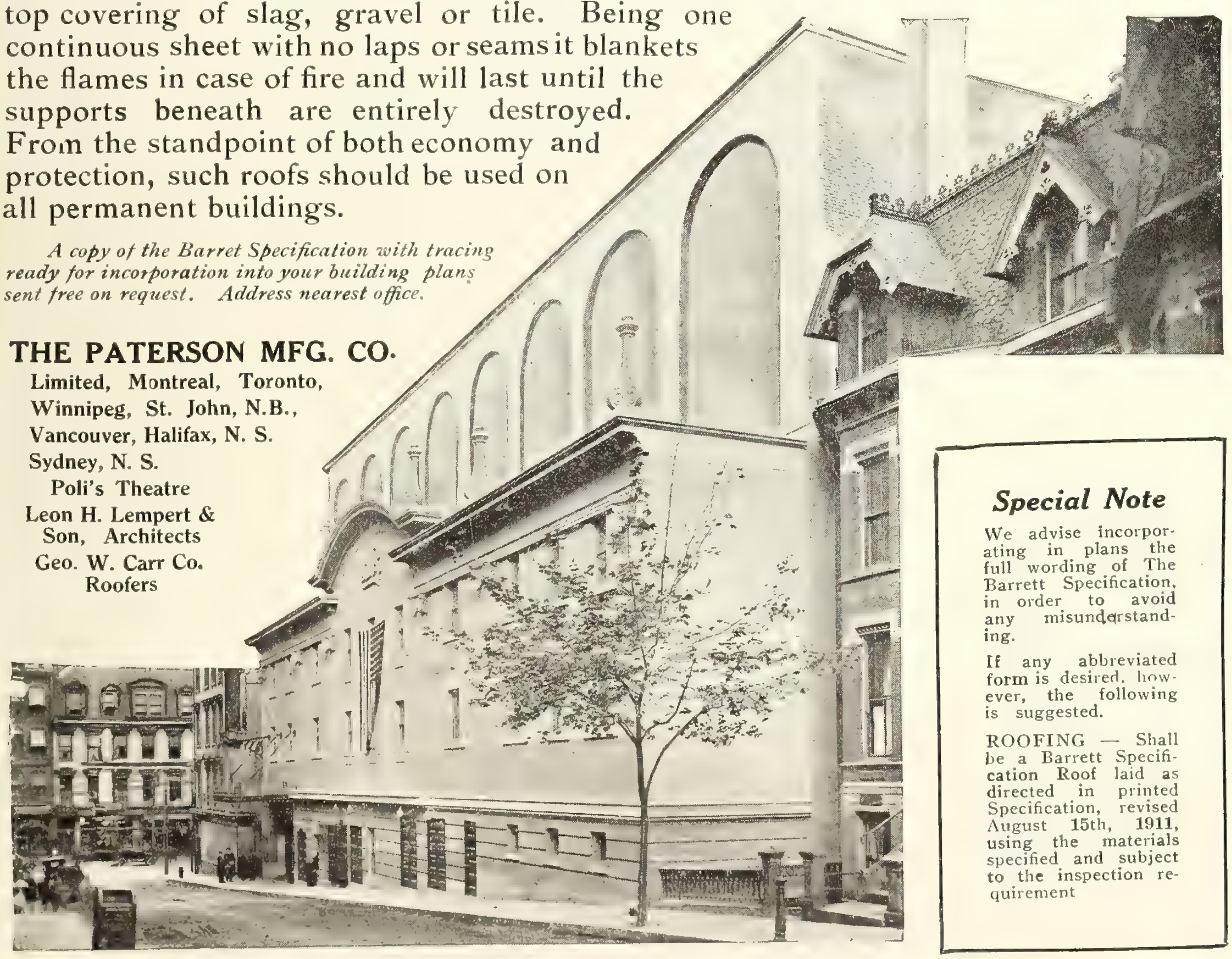

Poli's Theatre
Leon H. Lempert & Son, Architects
Geo. W. Carr Co. Roofers

Special Note

We advise incorporating in plans the full wording of The Barrett Specification, in order to avoid any misunderstanding.

If any abbreviated form is desired, however, the following is suggested.

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This illustration shows the PRIESTMAN WHOLE TINE GRAB digging in hard clay.

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(REG. U. S. PAT. OFF.)

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Ordnance Shop No. 4 of the Midvale Steel Co., Nicetown, Penn.

This shop has a content of about 5,250,000 cu. ft. It is heated by four apparatus, one in each corner of the building. Each apparatus consists of an 8 x 4 Sturtevant fan driven by 8 x 12 Sturtevant Steam Engine. Each fan operates in connection with Sturtevant Pipe Coil Heater arranged for Exhaust Steam.

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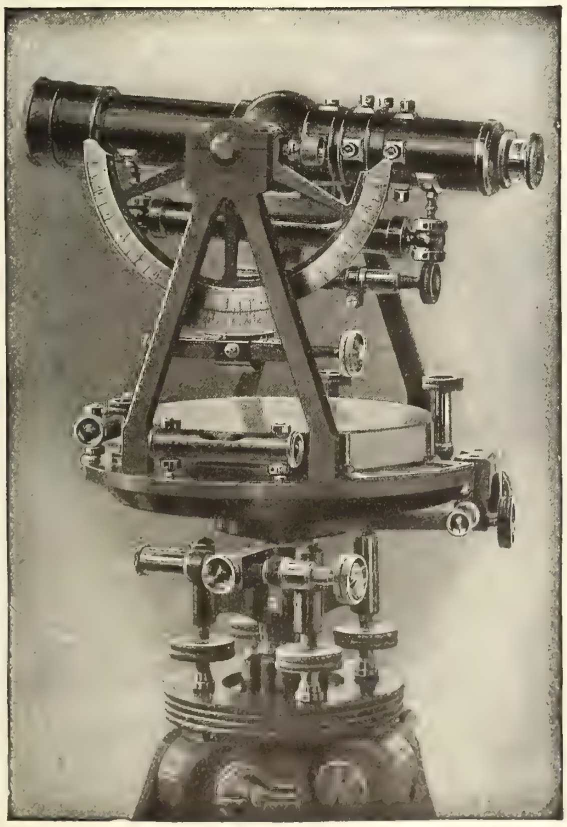

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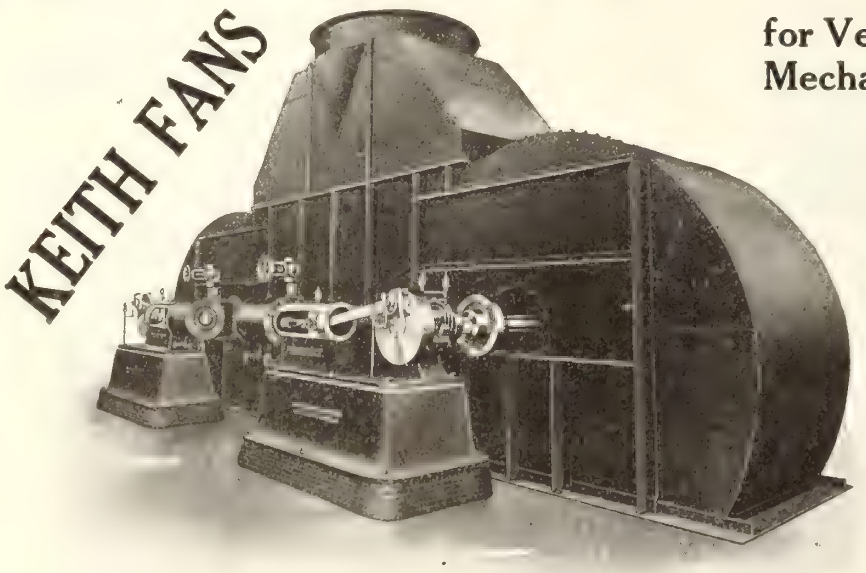

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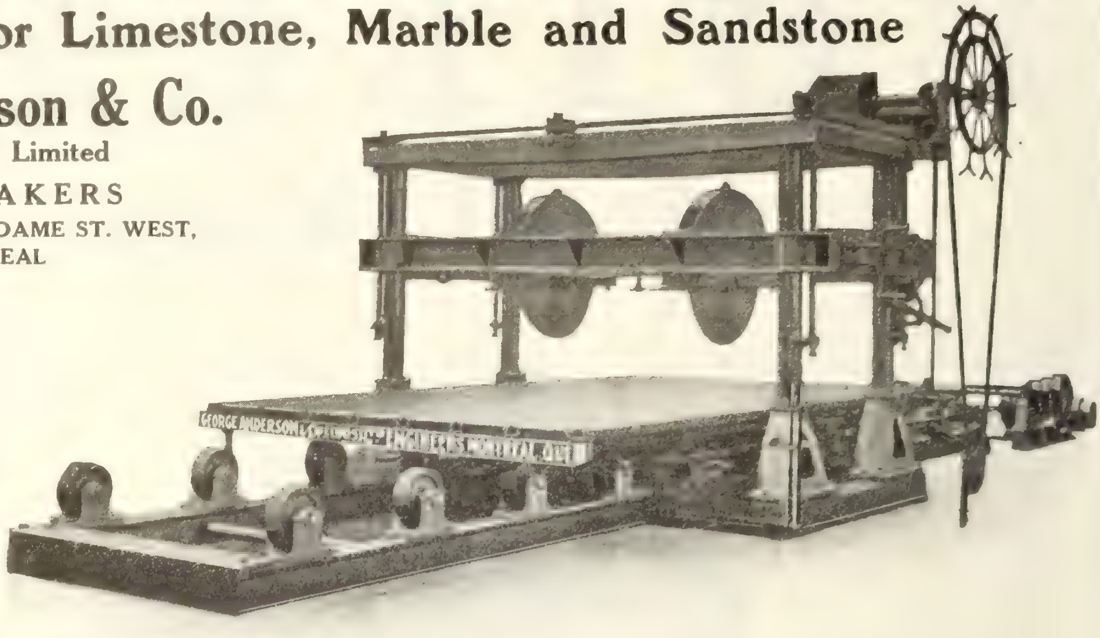

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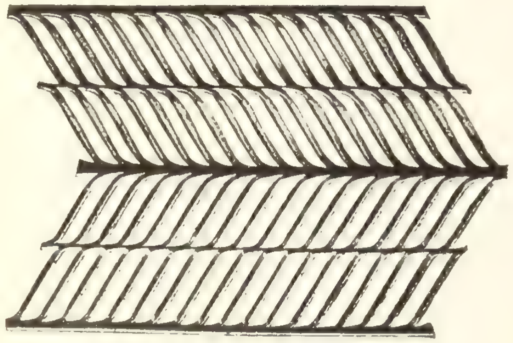

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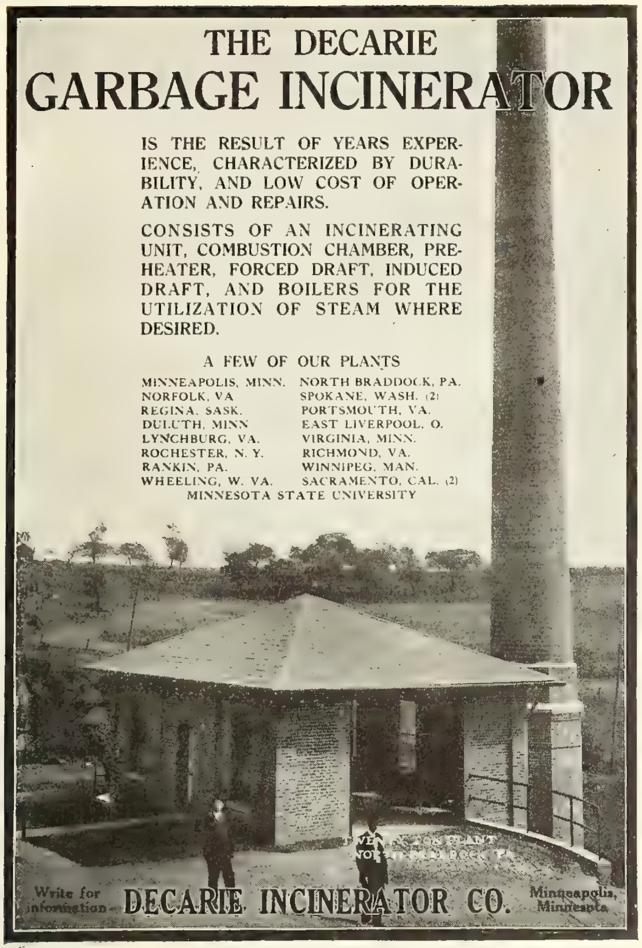

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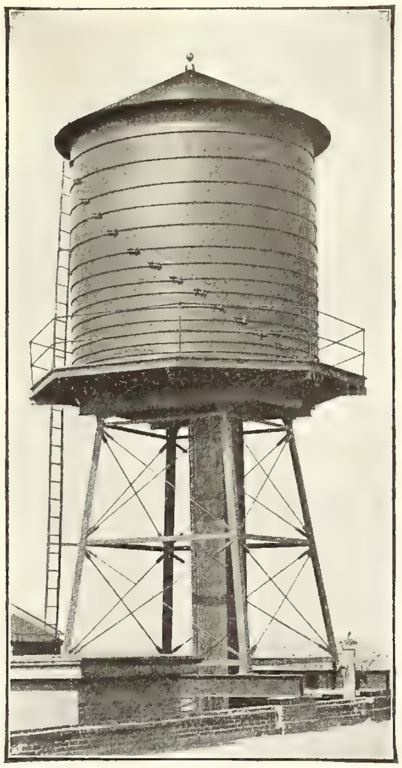

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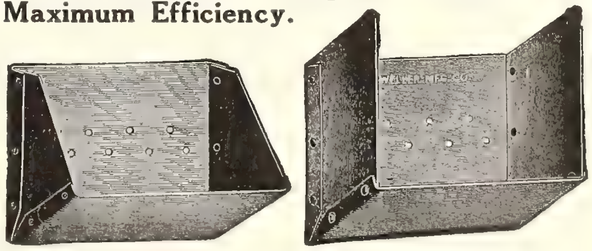

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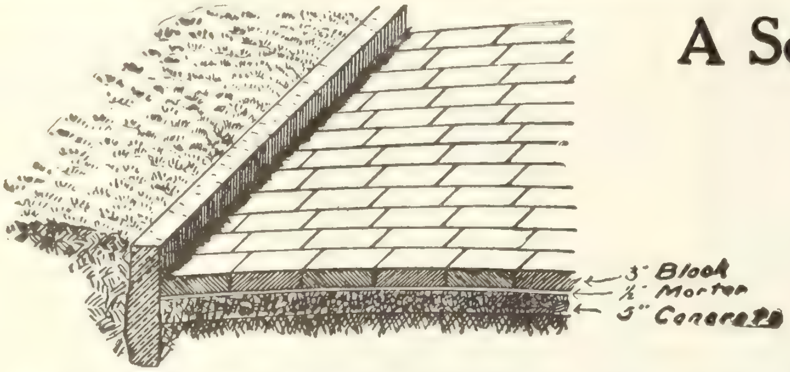

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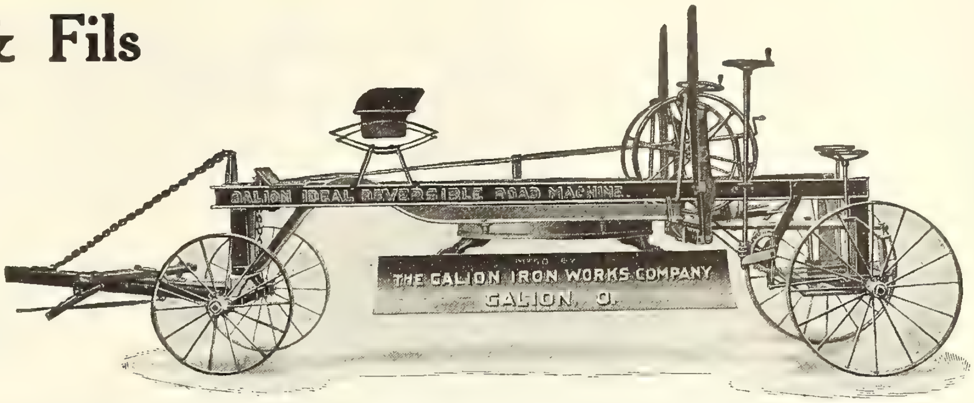
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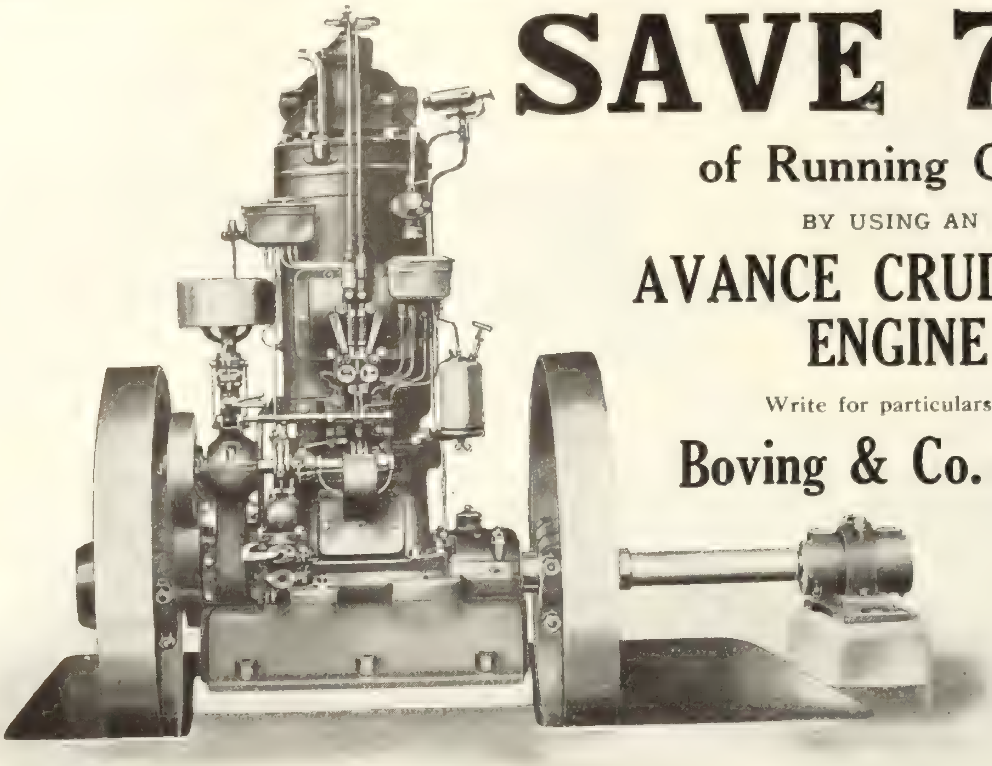

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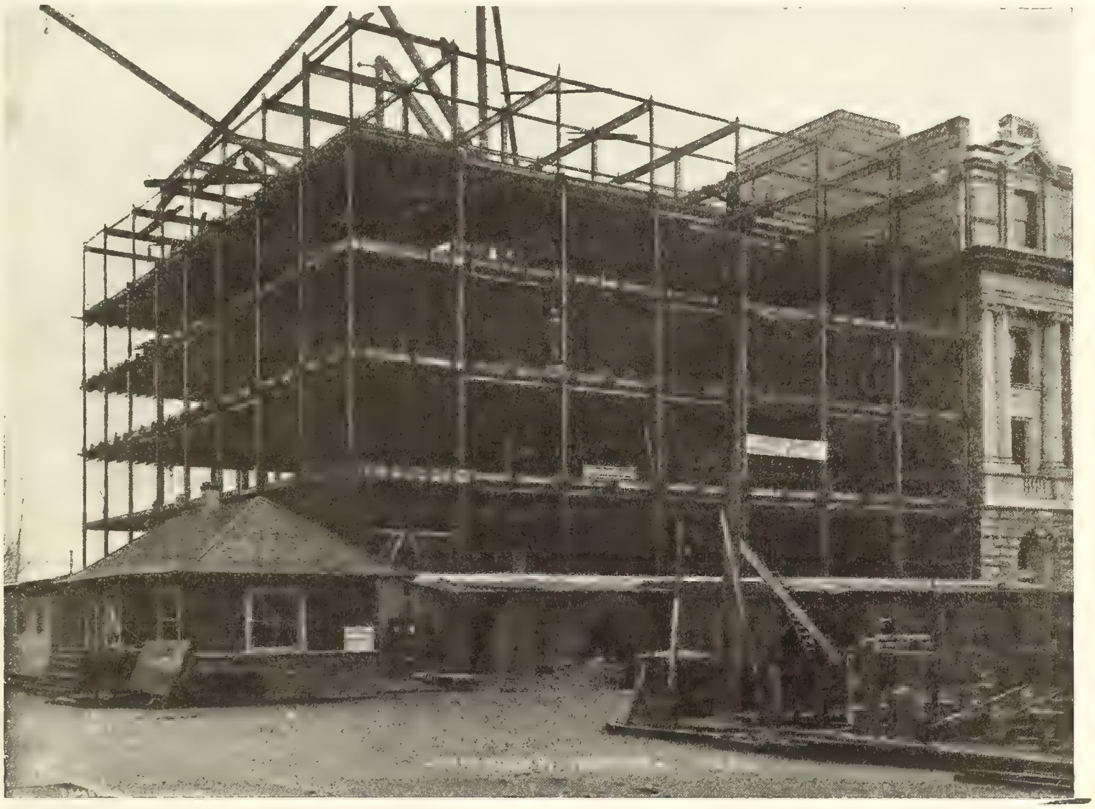

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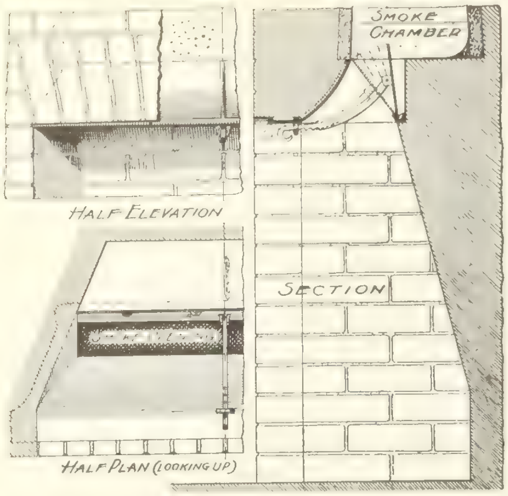

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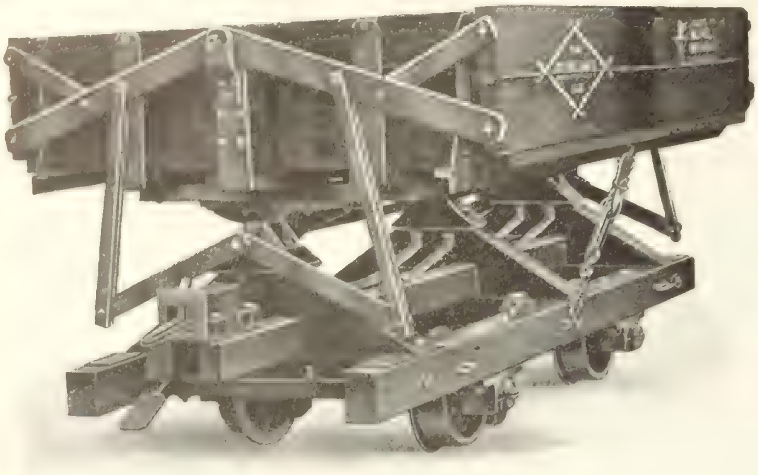

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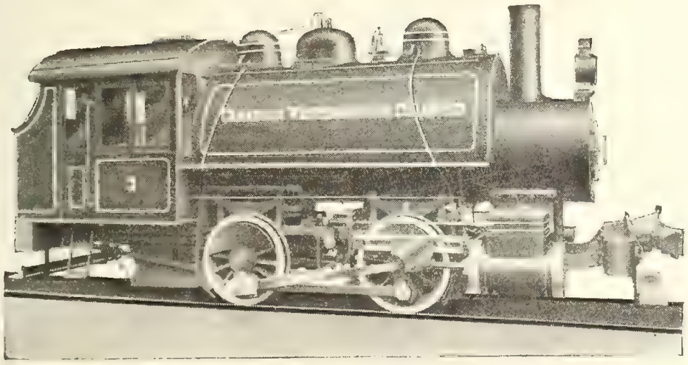

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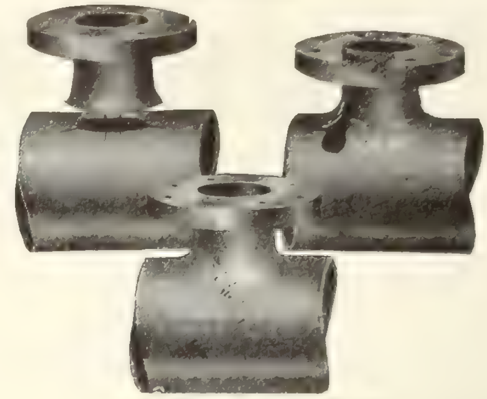

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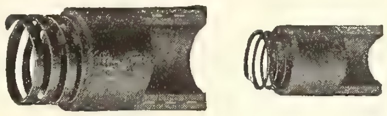

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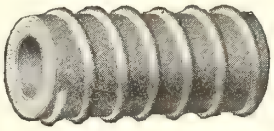

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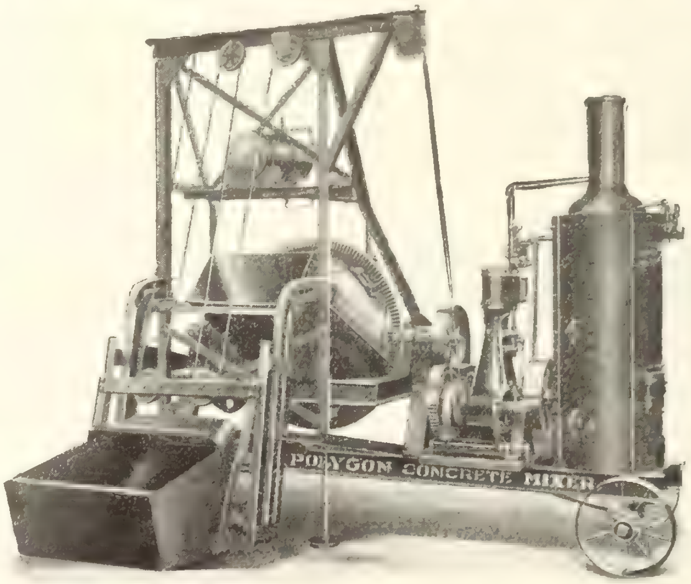

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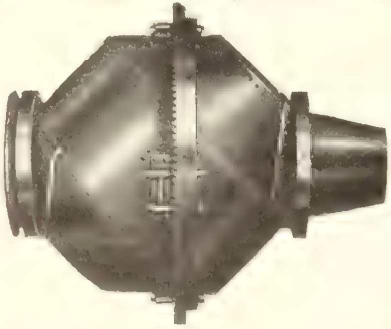

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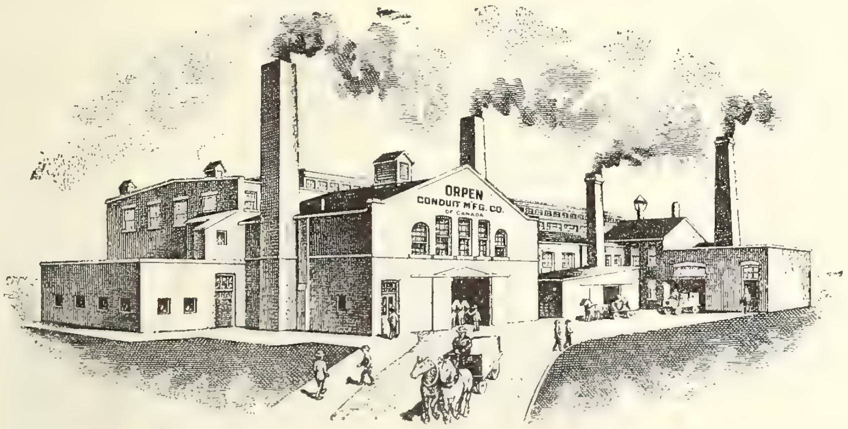
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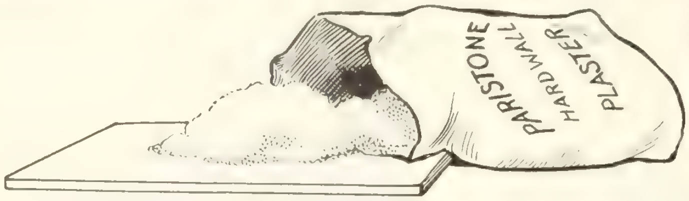

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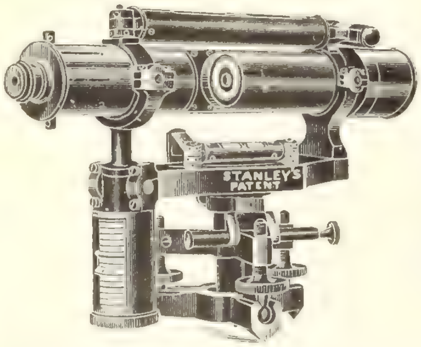

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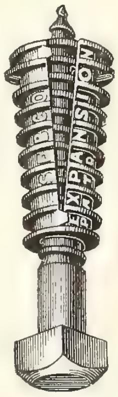

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ESTABLISHED 1886

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Vol. 27 September 24, 1913 No. 39

Vancouver Joins Cities of Notorious Administration

SOME time ago it was erroneously reported that Mr. F. L. Fellowes, City Engineer of Vancouver, had been asked to terminate his agreement with the city owing to loss sustained through defective water pipes that had been approved by his department. The fact was that at that time an investigation (concluded on September 12) was in progress and that the council had decided to cancel the present agreement with Mr. Fellowes, which calls for six months' notice, and to enter into new arrangements.

City Engineer Fellowes has been referred to not infrequently as "the highest paid municipal engineer in the Dominion." By the same token he is the most harassed official between the Atlantic and the Pacific. Mr. Fellowes has been dragged into a tiresome controversy over the acceptance of steel pipe supplied by a Pittsburg firm, the National Tube Company. The pipe is of the company's usual standard, but the water superintendent of Vancouver, who is supposed to receive his instruction from the city engineer, condemned it severely, without going through the formality of an inspection. Needless to say that after making such a report the worthy superintendent soon had a good-sized following in the council and that by the pulling of a string here and the exercising of a little political influence there the city engineer's position was speedily made uncomfortably warm.

Were we to attempt to recite the various details of the investigation—details which have provided the local press with columns and columns of wasted effort—our task would be overwhelming. We gladly pass over the senseless quibblings with which the Vancouver public have been regaled and record the fact that the investigation has been wound up with the acceptance of terms drawn up by the National Tube Company and that the stand made throughout by the city engineer has been completely vindicated. More, City Engineer Fellowes has shown up the unsatisfactory methods of inspection laid down by the council and their unfair and unpractical interpretation of specifications.

The city of Vancouver, or rather the persons to whom the administration of the city of Vancouver is entrusted, seem to have no appreciation of the fact that the strictest fair play is due to a man who has been taken at the zenith of his professional career from a growing city where he was not only making good but distinguishing himself. The ignorant and irresponsible men who criticised Mr. Fellowes at the Vancouver investigation as "not big enough"* for his position and "not commanding the confidence of the citizens"* are surely not competent from their narrow viewpoint and limited experience to criticise one who has been associated with some of the most important and interesting developments in the country.

Looking back over Mr. Fellowes' record we find that he has been identified with dozens of important works and that his name has been associated with some of the leading practitioners of the country. With Mr. Janin and Mr. Chipman a few years back he represented the Federal Government upon a commission which reported on the best system of drainage for the west end of the city of Montreal and adjoining municipalities. He investigated the various systems of lighting, filtration and incineration in leading cities of Canada and the United States, and on his report the plants now in operation at Westmount were established.

The work carried out last year in the city of Vancouver under the supervision of Mr. Fellowes was phenomenal—the largest in local history, in fact larger than the sum total of the preceding nine years' work, equalling, if not exceeding, the records of the big eastern cities.

It would seem that Mr. Fellowes had been unfortunate in taking over the engineering development of a city strong enough to pay a large salary and weak enough to engage a man upon whom the responsibility of all engineering undertakings would devolve but who was not to be supported as the supreme head of his department. Further, it would seem that the administration of the city of Vancouver had been weakened by the system of ward representation.

The investigation, as we have followed it, discloses a lamentable lack of well-balanced men in the Vancouver council. Vancouver, like many of our eastern cities, is suffering from the effects of electing to the council men who have not yet developed the ability to shoulder the responsibility of their own statements, let alone the important work of a city peopled by hundreds of thousands. Higher standards in every department of our administration would produce correspondingly higher results in executive branches. It is the universal cry of a higher standard of representation in which Vancouver is silently joining.

It is possible that the city of Vancouver, which—thanks largely to the able work of City Engineer Fellowes and his predecessors in office—has made great strides in recent years, is becoming over-confident. At any rate, the swaggering assertions of its aldermen as reported in the local press would incline one to that belief. We are not vindictive, but we do hope that if ever Vancouver is at its wits' ends to induce another self-respecting member of the profession to become city engineer, the trouble will be shared by the swaggering individuals responsible for the recent rumpus.

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* For the origin of these phrases see the proceedings of Toronto's first city council.

Triumph for Canadian Shipbuilding Industry

AN impetus to the ship building trade which will undoubtedly have its effect upon the constructional world generally will be given by the new Government regulations which provide that all vessels built for the Canadian Government must be constructed in the Dominion. In effect this means a new industry for Canada, for of the Dominion Government vessels built in recent years probably seventy-five per cent. have been constructed in Great Britain. The regulations enact that all vessels built for the Government must be constructed wholly of British materials.

Canadian ship-builders have been working towards this goal for a number of years and they are to be congratulated upon having attained it. The consummation of the enactment, however, places upon them a heavy responsibility. The development of such industries on efficient and successful lines requires an aggressive, far-seeing policy, and the problems of finance are not inconsiderable. However, in other fields we have many great institutions which attest the soundness of our judgment and the aggressiveness of our policy and there is no reason to suppose that we shall not rise to the occasion in this case, **for it is an occasion worthy of great enterprise.**

It is of interest to record that the first vessel to be constructed under the new regulations is to be built in Toronto by the Polson Iron Works.

The Peterborough Disaster

ENQUIRY on our part has revealed nothing but reticence in connection with the collapse of the Turnbull Building at Peterborough, which resulted in the loss of five lives. The jury brought in their verdict last week, but the evidence was not sufficient either to determine the cause of the collapse or to fix the blame.

Possibly, the scanty information may be traced to the fact that a number of law-suits are pending; possibly this is only one of a number of considerations.

Reticence to a certain degree is proper. A man is not called upon to take the responsibility of statements which may or may not be founded on fact. At the same time the community at large, and particularly the constructional interests, are entitled to have timely information on such matters. All that we are told one month after the disaster is that the jury were unable to arrive at any conclusions owing to the insufficiency of the evidence and that they recommend the appointment of a building inspector whose duties would include the supervision of structures undergoing alterations.

We can make certain deductions from the evidence given by the architect appointed to examine the premises on behalf of the Attorney-General's department. This gentleman found serious defects in the construction of the basement wall upon which the supporting pillars were erected. The wall was under strength, the bricks were soft and the mortar was poor. Scanty as these details are they show the importance of adequate inspection in every branch of constructional work and point the moral that where human lives are a consideration the question of economy is criminal.

It is to be hoped that more definite information will be forthcoming from the authorities and that further details will not be withheld until such time as public interest has waned to a point where it is a negligible factor.

The Passing of a Great Contracting Firm

MOST of us who have heard of the late Sir John Aird find some interest in the statement that his firm will soon pass out of existence. The history of Sir John Aird & Company has been wrapped up with the growth and development not only of the British Empire but of nearly every country in the world during the last eighty years. The name of Aird is the most widely known in the contracting world to-day.

Sir John Aird, Bart., the founder of the firm, died in 1911, and it appears that the present baronet, finding himself face to face with more strenuous competition, is not desirous of continuing the business. He is a wealthy man, and is not willing, perhaps, to take the risks involved in the great contracting operations for which his firm competes. Moreover the firm has been involved in several big legal disputes **and it is quite possible that the present head is tiring of the law's vexations.**

Recently the firm was concerned in one of the most famous law cases of all time—that of Messrs. Aird versus the Tanjong Pagar Dock board, or really the Straits Settlement government. This trial was easily the most expensive of its kind, and though the verdict was eminently satisfactory to the contracting firm, there is reason to believe that the settlement was disappointing.

The disappearance of this firm marks a landmark in the world's contracting history. It may give some idea of the extent of their business when it is mentioned that for many years their outgoings were $50,000 a day.

Under the terms of the proposed new building code for New York City, when an architect, builder, or owner desires a modification of any provision in the building ordinance, or a ruling on any matter not covered by it, he must make written application therefore with the reasons for his request. The building superintendent must give his decision, with reasons, in writing; the same is to be published in the official "City Record" within two weeks and filed, properly indexed, in the permanent records of the building department. These records, to which the public shall have free access, may be cited as precedents.

Quebec Water Supplies Discussed at Montreal Convention

MEMBERS of the Sanitary Services of the Province of Quebec last week held their fifth annual convention in Laval University, Montreal. Most of the papers read and the subjects discussed related to the purely medical side of civic administration, including infant mortality, medical inspection of schools, meat inspection, etc.

The question of water supplies in the province of Quebec was dealt with by Mr. Mac. H. McCrady, of the Provincial Board of Health. He stated that about 41 per cent. of the population obtained water from rivers and streams, which was a rather big figure to be dependent on such sources. This was due largely to the fact that towns were found most thickly clustered together on the river banks. Some rivers had water which was colored, but that was no real criterion. The more serious question was that of pollution from sewage. This might be found in an apparently clear water. An examination of water courses showed that 30 per cent. of streams only were satisfactory from the drinking standpoint. Of springs 80 per cent. were good, but of wells only 25 per cent. were satisfactory.

It would be beneficial, said Mr. McCrady, to inaugurate an educational campaign for the purpose of teaching rural and small town communities to protect their underground water supplies. Only one per cent. of the population was supplied with water from the lakes, which was the more astonishing as lakes were an ideal supply. This meant that great opportunities were being missed by certain communities. The supplies were found to be divided up thus: 41 per cent. from streams, one per cent. from lakes, and 58 per cent. from underground springs or wells.

In touching on purification, Mr. McCrady blamed municipalities for their laxity in this respect, and said in some cases where plants had been installed, they were entirely ineffective. "On the whole," he said, "with the exception of Montreal and suburbs, water purification systems in this province are not satisfactory. The general disregard of the need of purification is difficult to understand." Thirty per cent. of the population of the province had purification to some extent; 12 per cent. excellent river water, and one per cent. good lake water. It was expected that within the next five years every district would be provided with chemical filters with hyperchlorate.

Mr. James O. Meadows, in discussing the paper, pointed out that the initial cost of drawing supplies from lakes was such as to account for their small use. There were several large towns in the province, he said, which were using water from surface supplies of very doubtful quality.

The system of sewers in the province of Quebec was discussed in a paper by Mr. Theo. Lafreniere, C.E., in the course of which he described the various systems in use.

The report of the committee on the protection of water courses was made by Mr. Meadows. It was to the effect that the committee had drafted a bill by which certain powers would be conferred on the provincial board of health in regard to dealing with impure water systems and sewage purification. This bill had been sent to the Provincial Secretary last year, but no result had followed. Mr. Meadows urged that some government department should be empowered to superintend the installation of water purification plants, as much money had been frittered away on inadequate plants. It was agreed that the bill should again be pushed by officers of the convention.

Co-ordination of Engineering Research

TO get rid of unnecessary duplication of effort is one of the first objects of the efficiency expert in every field of human industry. In the pursuit of this ideal the division of labor has been carried to extraordinary lengths and specialization has attained a development never before equalled, says The Engineering Record. Close observers of industrial progress are beginning to realize, however, that specialization is in the last analysis a rather arbitrary matter, and that an interdependence exists between the various practical arts which demands anything but narrow knowledge of simple specialties for the most enduring success. It is increasingly essential for the expert in any one field to keep in touch with progress in even distantly related lines of work, and in the engineering profession in particular the catholicity of its interests, its uncounted points of contact with the business and scientific worlds, and the overlapping of its equipment and methods in different branches exact devotion to the broad outlook no less than faithful attention to details from the successful practitioner. It is this situation which commends to the attention of the engineer every carefully considered suggestion aimed to facilitate his knowledge of significant progress in the domain of physical science, and in this connection a paper on "Engineering Research and Its Co-ordination," read by Mr. G. H. Roberts at the July meeting of the Institution of Mechanical Engineers at Cambridge, England, is of special interest.

The author points out that no definite and generally recognized system has been formulated for making known to the profession the results of numerous private researches and experiments constantly in progress and emphasizes the need of a sort of world-wide docket of engineering research which will constitute a clearing house of information as to the kind of investigations in hand, the objects sought, and the results attained. The desirability of accomplishing this end needs little argument, for if it could be brought about it would undoubtedly save a great deal of time and money and vastly enhance the efficiency with which engineering research is conducted in different parts of the world. The day is certainly far distant when all duplication of research will be a things of the past—for the conditions surrounding investigations will always be enormously varied, and the personal equations and laboratory equipment of the investigators will often demand independent observation; but the fundamental point is to acquaint the profession as a whole with the research activities of individuals and organizations, and once this is done the saving in effort will repay the cost.

To specify in detail how this problem can best be solved is not feasible at the present moment, but the matter can be discussed to great advantage by engineers and should receive the best thought of many minds before any elaborate scheme is attempted. Mr. Roberts suggests that the Institution of Mechanical Engineers may be the proper clearing house of data and touches upon the possibilities of ultimately guiding research by the committee method. To make his proposals definite he presents as a nucleus about a dozen pages of tests made at the Woolwich Arsenal upon the mechanical properties of some 75 varieties of woods and 23 alloys; reviews the recommendations of the Standards Committee in regard to the proportions of test pieces, and briefly discusses the unification of methods of reporting. In view of the magnitude of the subject, however, and particularly because of the overwhelming mass of data in process of accumulation throughout the engineering world, it is open to debate whether the best way to start this campaign is not by the preparation of an index bibliography of current research, perhaps subdivided among the national engineering societies or else compiled in a central bureau reporting back to the great engineering organizations supporting it and contributing to its accumulations. There are, of course, many researches which those who meet their cost legitimately prefer to keep in private hands; but there is a huge volume of investigation under way to which restrictions upon publicity do not apply, and if the results of such work can be disseminated through an efficient organization a great advance will be made in the methods and spirit of modern engineering research.

Highway Bridge Design—Cross Sections of Bridges

Part II[*]

Specially contributed by F. Tissington[†]

IN Fig. 1 there is illustrated the usual arrangement of parts for Warren Poney Truss spans, particularly those having comparatively shallow trusses, say up to about 8 ft. 6 in. centres of gravity of top and bottom chords. A four-inch timber floor is used which is spiked to the nailing pieces on the I-beam stringers. This cross-section shows the vertical posts at the panel points. It will be noted that the angles composing these are arranged to lap over the chord angles. This feature, together with the knee brace angle secured to the floor beam, constitutes all the support the top chord obtains, but owing to the particular style adopted this arrangement has been found perfectly satisfactory. A further point to be noted is the connection of the handrailing to the truss; the cleats forming a support for the posts as well.

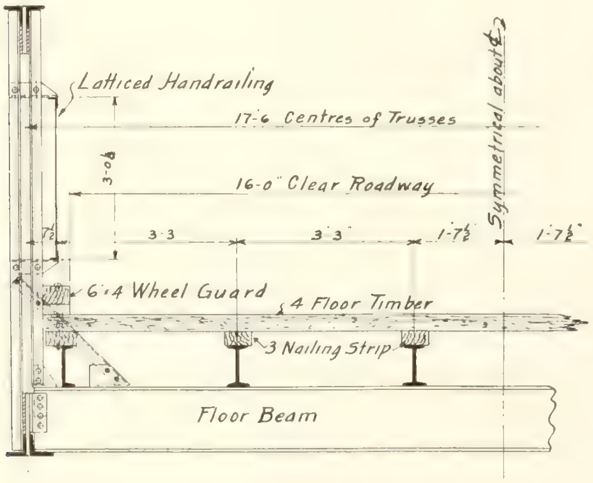

Fig. 1

The outside line of stringers are of channel section as they only have to support half the load of the other stringers.

Fig. 2 is a typical cross-section for a bridge with concrete floor, the truss also being of the Warren Poney type. It will be noticed that the posts are shown with outside stays, which is the usual type adopted for trusses that are more than 8 ft. 6 in. deep.

The stringers are packed up towards the centre of the floor beam, which gives a camber to the flooring and allows the rain water to run away easily.

Fig. 3 shows a cross-section of a Pratt through truss with a vertical clearance of 13 ft. underneath the overhead brace frames. The latter occur at the posts only. The floor stringers are in this case shown rivetted to the web of the floor beam, a course usually adopted for the larger spans owing to the additional stiffness given to the lower framing of the structure.

Fig 4 indicates a similar cross-section to the one just described with concrete floor and modifications to the sway frame arrangement.

This type of sway frame should only be used for comparatively short spans where the depth of truss prevents the use of the one shown in Fig. 3.

Trusses

The general outline of the trusses has been discussed in a previous article so that nothing further need be said on this point.

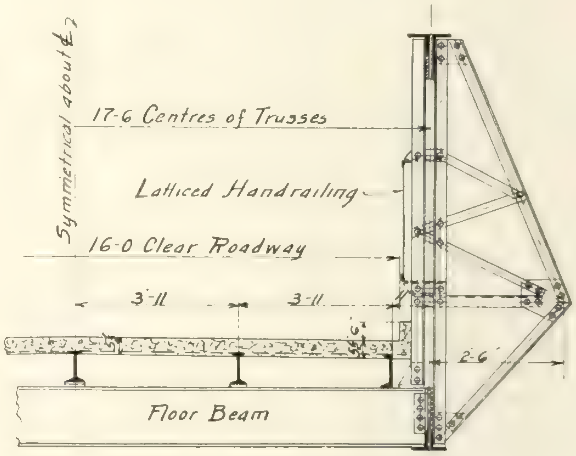

Fig. 2.

The selection of the various sections comprising the truss is a matter of some moment and the following considerations should be borne in mind.

(1) That the proposed sections should be readily obtainable from the rolling mills. All odd sizes being left out of consideration.

(2) Thin sections to be used in preference to thick, it being noted that not less than five-sixteenths of an inch is allowable.

Generally, the adoption of thin sections results in a smaller proportion of material being taken out of a tie by the rivet holes, whilst for struts a greater value of radius of gyration is obtainable for a given weight of material per foot run.

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[*] Part 1 was published in the Contract Record of Sept. 3, 1913.

(3) For the smaller spans it will be found economical to make the diagonals near the centre to the same templates, as in a number of cases the minimum size of angle (2½ x 2½ x 5-16) will fill the bill for at least two sets of diagonals on each side of the centre line of the truss, and a rivet or two extra will be more than compensated for by savings effected in template making, marking and assembling.

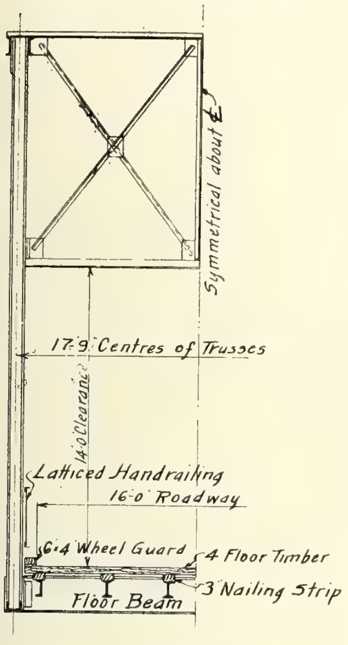

Fig. 3

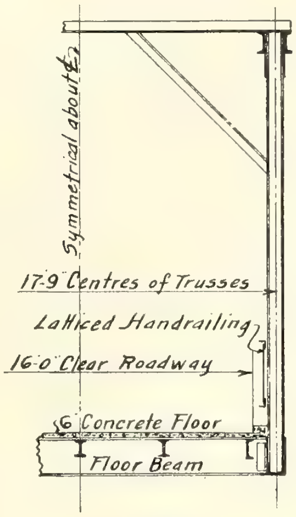

Fig. 4

(4) For light struts and diagonals with a reversal of stress the writer has adopted a section of two angles placed in the form of a cross, see Fig. 5. For comparatively long struts with light loading which necessitates the use of a large-sized angle when placed in the ordinary way (see Fig. 6) in order to obtain a ratio of length to radius of gyration that is permissable (maximum value not to exceed 120 times that of 1/r), the former arrangement will be found much more economical even taking into account the additional batten plates required.

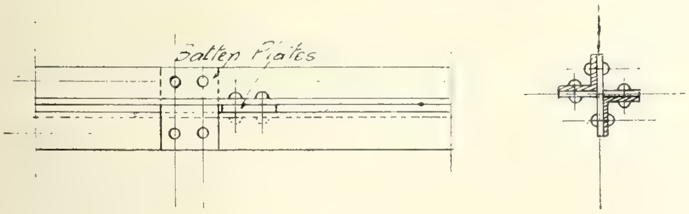

Fig. 5

This applies practically to all cases where the ratio of 1/r governs the section to be used rather than the area required to carry the total stress.

(5) For trusses where it is necessary to use a box section, composed of two channels placed some distance apart, it will in the majority of cases pay to use a smaller size channel with a cover plate on the top, owing to the lacing being expensive to manufacture and also because it cannot be counted as part of the sectional area of the number to resist direct stress.

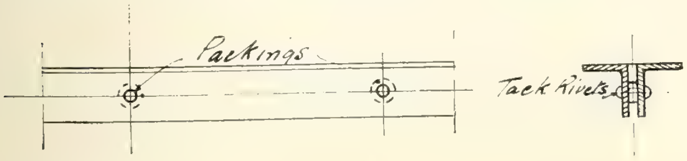

Fig. 6

(6) For through Pratt trusses the posts should be of H section wherever possible, i.e., Bethlehem column or girder sections, broad flange beams, etc. The use of the above eliminates a large amount of detail work as they will usually replace a post composed of two channels laced.

(7) In similar trusses to those mentioned in item (6) the substitution of one or two channels (in the latter case placed back to back) or H sections for two or four angles either battened or laced will produce a small economy for the same reasons given previously.

It should be noted however that these are general terms and may not apply to every individual case.

(8) For Warren Poney Trusses the use of gusset plates approximately thick enough to develop the full double shear value of the rivets in bearing also is good practice as this eliminates a good many field rivets which are always expensive to drive.

(9) Further, small types of trusses, the joints should preferably be made on the far side of a panel point looking from the centre of the truss for the reason that it is then only necessary to provide sufficient rivets in the joint to transmit the lower stress of the two members in the chords connected together (see Fig. 7).

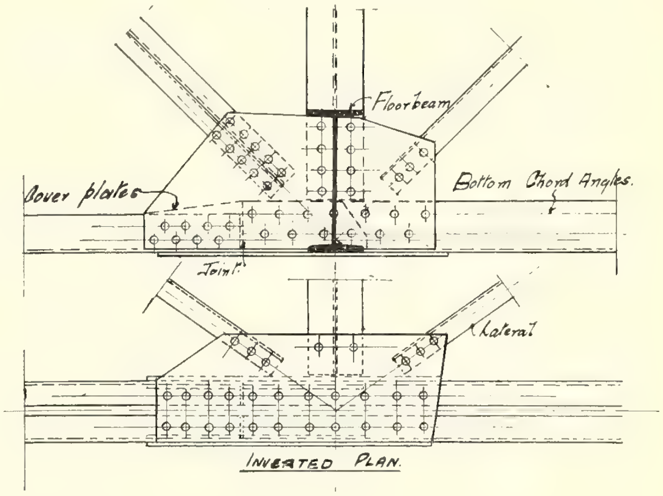

Fig. 7

(10) When sidewalks are added to one side of the bridge only throwing an additional load on one truss, it will be found that a saving in manufacture will result if the additional sectional area required to carry the heavier load is provided by increasing the thickness of the sections used on the other truss, as the same templates may then be used.

Seasoning of timbers, 8 x 16 inches in cross-section, should extend through two entire summers to reach a thoroughly air-dry condition. If seasoning is started in the hot summer months the loss of moisture is at first very rapid, and checking is invariably induced. The best results are obtained when the air seasoning is started in the late fall or early winter months. The effect of shrinking in redwood timbers is not very noticeable, although it contains much moisture when cut. It can, therefore, be seasoned readily without serious checking.

The Waterproofing of Concrete Surfaces

THE work of the committee was found to be divided naturally into three branches:—(1) Causes of permeability, and methods of avoiding them; (2) Waterproofing by the addition of other substances; (3) Subsequent treatment of exposed surfaces.

In the laboratory and under test conditions using properly graded and sized coarse and fine aggregates, in mixtures ranging from 1 cement, 2 sand and 4 stone to 1 cement, 3 sand and 6 stone, impermeable concrete can invariably be produced. But the fact remains, nevertheless, that the reverse often obtains in actual construction, permeable concretes being found even with 1 cement, 2 sand and 4 stone mixtures and are of frequent occurrence where the quantity of the aggregate is increased. This the committee attributes to:

(a) Defective workmanship, resulting from improper proportioning, lack of thorough mixing, separation of the coarse aggregate from the fine aggregate and cement in transporting and placing the mixed concrete, lack of density through insufficient tamping or spading, and improper bonding of work joints, etc.

(b) The use of imperfectly sized and properly graded aggregates.

(c) The use of excessive water, causing shrinkage cracks and formation of laitance seams.

(d) The lack of proper provision to take care of expansion and contraction, causing subsequent cracking.

Properly graded sands and coarse aggregates are rarely, if ever, found in nature in sufficient quantities to be available for large construction, and the effect of poorly graded aggregates in producing permeable concrete is aggravated by poor and inefficient field work. Even if the added expense could be afforded of screening and remixing the aggregates so as to secure proper granulometric composition to give the density required to make untreated concretes impermeable, it is seemingly a commercial impossibility on large construction to obtain workmanship even approximating that found in laboratory work.

The committee finds that in consequence of these conditions substances calculated to make the concrete more impermeable—either incorporated in the cement or added to the concrete during mixing—are often used.

Value of Waterproofing Compounds

While it has been impossible for the committee to test all of the special waterproofing compounds on the market, it has investigated a sufficient number of these, as well as the use of certain very finely divided mineral products, to form a general idea of the value of the different types. The committee finds:

(a) That the majority of patented and proprietary integral compounds tested have little or no immediate or permanent effect on the permeability of concrete and that some of these even have an injurious effect on the strength of mortar and concrete in which they are incorporated.

(b) That the permanent effect of such integral waterproofing additions, if dependent on the action of organic compounds, is very doubtful.

(c) That in view of their possible effect, not only upon the early strength, but also upon the durability of concrete after considerable periods, no integral waterproofing material should be used unless it has been subjected to long-time practical tests under proper observation to demonstrate its value, and unless its ingredients and the proportion in which they are present are known.

(d) That in general more desirable results are obtainable from inert compounds acting mechanically than from active compounds whose efficiency depends on change of form through chemical action after addition to the concrete.

(e) That, assuming average quality as to size of aggregates and reasonably good workmanship in the mixing and placing of the concretes, the addition of from 10 to 20 per cent. of very finely divided void-filling mineral substances may be expected to result in the production of concrete which under ordinary conditions of exposure will be found impermeable, provided the work joints are properly bonded and cracks do not develop on drying, or through change in volume due to atmospheric changes, or by settlement.

Surface Treatment

While external treatment of concrete would not be necessary if the concrete itself, either naturally or by the addition of waterproofing material, was impermeable, it has been found in practice that in large construction, no matter how carefully the concrete itself has been made, cracks are apt to develop, due to shrinkage in drying out, expansion and contraction under change of temperature and moisture content and through settlement.

It is, therefore, often advisable on important construction to anticipate and provide for the possible occurrence of such cracks by external treatment with protective coatings. Such coating must be sufficiently elastic and cohesive to prevent the cracks extending through the coating itself. The application of merely penetrative void-filling liquid washes will not prevent the passage of water due to cracking of the concrete. The committee has, therefore, divided surface treatment into two hands:

(a) Penetrative void-filling liquid washes.

(b) Protective coatings, including all surface applications intended to prevent water coming in contact with the concrete.

While some penetrative washes may be efficient in rendering concrete waterproof for limited periods, their efficiency may decrease with time and it may be necessary to repeat such treatment. The committee, therefore, believes that the first effort should be made to secure a concrete that is impermeable in itself and that penetrative, void-filling washes should only be resorted to as a corrective measure.

While protective extraneous bituminous or asphaltic coatings are unnecessary, so far as the major portion of the concrete surface is concerned, provided the concrete is impermeable, they are valuable as a protection where cracks develop in a structure. It is therefore recommended that combination of inert void-filling substances and extraneous waterproofing be adopted in especially difficult or important work of any nature.

Considering the use of bituminous or asphaltic coatings, the committee finds:

(a) That such protective coatings are often sub-

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* Conclusions reached by the Committee on Waterproofing Materials of the American Society of Testing Materials.

ject to more or less deterioration with time, and may be attacked by injurious vapors or deleterious substances in solution in the water coming in contact with them.

(b) That the most effective method for applying such protection is either the setting of a course of impervious brick dipped in bituminous material into a solid bed of bituminous material or the application of a sufficient number of layers of satisfactory membranous material cemented together with hot bitumen.

(c) That their durability and efficiency are very largely dependent on the care with which they are applied.

Such care refers particularly to proper cleaning and preparation of the concrete to insure as dry a surface as possible before application of the protective covering, the lapping of all joints of the membranous layers, and their thorough coating with the protective material. The use of this method of protection is further desirable because proper bituminous coverings offer resistance to stray electrical currents.

In conclusion, the committee points out that no addition of waterproofing compounds or substances can be relied upon to counteract completely the effect of bad workmanship, and that the production of impermeable concrete can only be hoped for where there is determined insistence at all times on good workmanship on all structures.

Influence of Painting on the Rusting of Iron

WHILE the ultimate nature of the rusting of iron is being contested strenuously says a technical writer in Engineering, the question of the protection of iron by the aid of suitable coatings has advanced little of late. Most scientists probably incline to an electrolytic theory of rusting; some dispute it.

Nobody denies that there is a danger of rusting wherever local potential differences exist in or on the iron. To insist or to deny that the ultimate cause of rusting must be electrolytic is perhaps going ultra vires. But we may assert that local potential differences are a very common, possibly an essential, symptom accompanying rusting processes. We galvanize iron with zinc, and not with copper, because we know that the zinc is more liable to corrosion in the combination of iron and zinc, and the iron more liable to corrode in the combination of iron and copper; and we find that potential determinations would induce us to galvanize iron with some less noble metal if that process were unknown. But we are apt to overlook that local potential differences are also set up whenever the iron surface is not perfectly clean and free, and when any coating, an oxide graphite, a point or simply moisture, is present.

Many people would probably say that good painting should afford an efficient protection against rusting, provided the paint be itself non-corrosive, uniform, impermeable to moisture, and non-porous. That was substantially the conclusion at which Messrs. William H. Walker and Warren K. Lewis—men well known in this field of research—arrived, at the Massachusetts Institute of Technology when investigating, in 1909, a peculiar case of failure of preserved-fruit tin cans which had been varnished inside. The remedy seemed to be: if one coat of varnish or paint is not sufficent because of the pores, apply two or several coats.

Effect of Several Coats

But now comes Messrs. Erig Liebreich and Fritz Spitzer, of Berlin, with the statement that one coat of varnish or paint may protect the iron, but that the application of several coats will actually promote rusting.

Liebreich and Spitzer had been experimenting with various iron varnishes, and they had painted numbers of symbols on the coatings. Upon removing the coating afterwards they could always read the characters on the iron surface, which was most corroded in those spots, and they found that this was so also with painted sign-boards which they examined. According to their experience, the rule should therefore be: use a good, non-corrosive iron paint, but do not apply more than one coating. The research is not yet completed, but the subject is worth looking into.

We will first refer to the experiments of Walker and Lewis. As some acid fruit preserves attack tins, some tins were carefully varnished inside with a high-grade copal-linseed oil varnish; but some of these tins were eaten through in six weeks, and they all corroded rapidly. The lacquer had been baked at 140 deg. C., and had appeared to form a perfect coating of the sheet metal. In making the can, however, the film had probably been ruptured by the dye, the burning, etc., and "when the fruit was introduced the depolarizing action of the lacquer, coupled with that of the little air left in the can, threw the protected areas into a cathodic state, concentrating the solution of the metal at the exposed points, so that both tin and iron were dissolved."

Corrosion Electrolytic

The explanation is thus suggested that the corrosion was electrolytic (i.e., made the iron more liable to oxidation), because the lacquer contained unsaturated compounds which acted as depolarizers on nascent hydrogen. This explanation is not easy to follow; but the fact remains that the unlacquered tins held out longer than the lacquered ones.

Liebreich and Spitzer coated highly polished sheet-iron with various paints, consisting of linseed oil and some oxide (lead, zinc, iron), sometimes further mixed with carbon; the addition of carbon made no difference in their behavior. The sheets were suspended over boiling water for four days and nights. Half the surface of the iron was then bared of its coating with the aid of toulene, and the bare surface covered with vaseline to prevent any further rusting.

In all cases (except one presently to be mentioned) the iron had remained bright when one coat had been applied, but had rusted under two coats, and distinctly rusted still more under three and four coats of the same paint. Some commercial paints gave the same results. Potential differences were observed between iron wires coated with the paints in question and the bare iron wire, when both wires were dipped into salt solution. In a paper read before the Schiffbautechnische Gesellschaft in 1905, Ragg had already demonstrated that all paints show a potential difference against iron.

These potential differences would account for some corrosion, and the fact that linseed oil while being dried slowly oxidizes, and continually liberates both water and carbon, would provide the favorable conditions for some electrolytic action. But one does not see why several coats of paint should afford a poorer protection against rusting than one coat. In fact, were it not that there was protection in the first instance with one coating, one might think that the method of testing was altogether unsuitable. The steam might creep in from the edges, between the iron and the film of paint, and cause corrosion in that way.

Liebreich and Spitzer are not yet in a position to offer any explanation, though they throw out a few hints. We venture to suggest that adhesion might enter into the problem. One thin coat of varnish or paint may adhere better to the iron surface than several coats united to a thick skin; the second film might tend to pull the first off the iron. That would depend upon the nature of the films.

We mentioned that one paint behaved exceptionally; this paint always afforded protection, whether applied in one or in several coatings. The article quoted does not explain the nature of this paint, merely designating it by reference to a German patent specification. The paint in question is prepared by Liebreich by mixing white lead and linseed oil in the proportion 25:6, and by adding a small quantity of solid potassium sulphide or cyanide to the cold stirred solution. The preparation, it is said, liberates free alkali when in contact with water, and the alkali is to prevent the rusting. As a rule, only one coat of this paint would be applied, and a covering consisting of the same paint without the sulphide then put on.

New Cyclopean Masonry Dam at Pittsburg

By Hiram A. Miller, Consulting Engineer, Boston

THE new Farnham dam which has been built to furnish an additional water supply to Pittsfield, Mass., has a gravity section of cyclopean masonry, about 600 ft. in length, with core walls at each end, making the total length of the dam about 900 ft. It is divided by expansion joints with inspection wells passing down through the joints, near the upstream side, to the bottom of the dam. These inspection wells are connected at the bottom by cast-iron drainage pipes, with a pipe leading from the bottom of the deepest well to the westerly side of the lower end of the spillway.

The gate well is on the upstream side of the dam outside the regular section, and is about 10 ft. square.

The expansion joints are 80 ft. apart, having 6-in. vertical offsets, 8 ft. apart through the dam. There is a copper strip across the joints on the upstream side of the inspection well similar to the one designed by the engineers of the Board of Water Supply of New York City for the Kensico dam. One side of the expansion joint is constructed of concrete blocks; on the other side the concrete of the cyclopean masonry is permitted to come to the joint. Before laying the concrete the side of the joint first constructed was coated with hot tar pitch, then a sheet of roofing paper was applied to the hot pitch, and the roofing paper was again coated with hot pitch.

During the last of February of the present year, after the coldest spell of the winter, when the reservoir was full, the total leakage through the joints measured at the end of the drainage pipe was at the rate of 18,000 gal. per day, which had decreased during the present summer to 200 gal. per day when the reservoir was drawn down 11 or 12 ft. Moisture appears on the downstream side of the dam to the extent that a large proportion of the area appears wet on a damp morning, but in the sunshiny afternoon the surface is mainly dry.

In the revised pressure diagram, made since the completion of the dam, the weight of the masonry is taken as 157 lb. per cubic foot, the volume of the inspection wells being included in the volume of the dam, the weight of the quartzite being 169 lb., and the weight of the schist 174 lb. The weight of the concrete was averaged at 151.2 lb. Ice pressure was taken at 10,000 lb. per linear foot at the surface of the water. It was assumed that the upward pressure of water under the dam would be equal to the full pressure of the water at the upstream side, and that it would be nothing at three-quarters of the distance from the upstream side to the downstream side, either at the bottom of the dam or at any horizontal section of the masonry. When the reservoir is empty the pressure line passes about 3 in. outside of the middle third, but if the deduction for the inspection wells had been taken out of the vertical longitudinal section in which they are, instead of being distributed through the total volume of the dam, and if the lesser weight of the masonry near the upstream face of the dam, being all concrete, had been taken into account, this pressure line would not have passed outside the middle third. The pressure will keep within the middle third, in accordance with the above assumptions, when the reservoir is full to the elevation of the spillway. It will also keep within the middle third with the water 5 ft. higher, provided there is no ice pressure. Consequently flashboards 5 ft. high can be safely placed across the spillways, provided they are removed before ice forms on the surface of the reservoir to any great thickness; and provided also that there is no depth of water passing over the spillway.

The use of concrete is not a new thing; it is as old almost as the world. The Romans used it as a method of construction and also as a fill, with the permanent forms of brick veneer or stone. The Spaniards and Italians both used it and the Mexicans also. The principal types of architecture developed along these lines of construction are those of Spain and Italy particularly, and the best modern expression of this type of construction in America is to be found in Carrere and Hastings' Ponce De Leon and Alcazar hotels in Florida. These buildings are of concrete with terra-cotta and brick trimmings around the openings, and with Spanish tile roof with necessary overhang. The colour contrast gives the plain wall surface additional value. This type or similar architecture must be used in order to get value and beauty from the simplicity of a straightforward monolithic concrete wall. Classic or Renaissance forms in cast concrete are at best poor imitations of the genuine living styles; so that the sooner we realize the value of concrete beams and corbels carrying a red tile overhanging cornice instead of a classic imitation, just so much the sooner shall we arrive at the solution of our problems, for construction dominates and determines style.

Protecting Buildings Against Lightning

Important Questions and Answers on the Placing and Value of Rods — Danger in Cities Relatively Small*

IN looking over recent articles dealing with lightning and lightning protection one is struck by the prominence given to protection of electric transmission lines and electric apparatus generally, while practically no contributions have been made to the subject of protection of buildings since the famous work by Sir Oliver Lodge years ago. Yet the protection of buildings unquestionably is as important as the protection of transmission lines and there are thousands of people interested in protecting their homes to every one interested in a transmission line.

To people living in cities the subject is, however, of little or no interest. Experience has shown that the extensive networks of wires, metal roofs, etc., are usually ample for protection. The man living in the country, however, is very much concerned, as experience has shown that in certain localities at least it is indeed tempting providence not to have some lightning rod scheme.

In a paper presented before the Illinois State Electric Association and condensed in Engineering News, Mr. Berg discusses the laws represented in, and the electric characteristics of lightning discharges, and, in conclusion, answers a series of questions, given here in part, on the best method of affording protection.

"Is there any real advantage in the installation of lightning rods or do they draw lightning and thereby add to the danger?" Experience seems to have settled beyond reasonable doubt that if properly installed, lightning rods afford considerable protection. Any lightning rod "draws" lightning if by that expression is meant that it prepares, under certain conditions, an easier path for the lightning discharge than would be the case if it were not there. The conducting streamers issuing from the rod tend to equalize the potential between earth and cloud and thus diminish the severity of a stroke and possibly prevent it altogether. Yet it may also be argued that unless there are many such streamers the rod cannot always cope with the situation and a stroke may result from them. This feature is dealt with later under another heading.

"Can a building be perfectly protected from lightning?" The answer must be no, except perhaps in the case of a thoroughly grounded all-metal building.

"How much protection does a lightning rod afford?" Unquestionably some if properly installed, but it may make matters worse in some cases. Assume for instance that a large building is equipped with a high, but broken, rod or a rod having poor joints or a high resistance to ground, say several hundred ohms, which undoubtedly sometimes is the case. Such a rod could serve the function of equalizing the potential between cloud and earth almost as effectively as a good rod, and were there only a sufficient number of them it is conceivable that the neutralization of potential would be so complete as to make a flash discharge practically impossible. A building having one rod only, however, is considered at present. The rod is assumed as projecting considerably above the building. If the electric tension is great, unquestionably streamers are emitted, the air above the rod is made fairly conductive and thus the discharge is invited.

The question is then: "How can such a rod take care of a discharge " The discharge current frequently is very large and while the ohmic resistance of the rod is practically immaterial as long as it is at all reasonable, it must not approach or exceed the normal value of the impedance. In a rod, say, 30 feet long, the ohmic resistance of even the smallest practical iron conductor is a fraction of an ohm only and the impedance is perhaps 30 to 75 ohms, depending upon the height and frequency of the discharge. It is easily seen that a poor joint may have many times this resistance; therefore, when the discharge encouraged by the streamers from the defective rod strikes the building it finds the rod entirely inadequate to cope with the situation. The voltage drop in the rod is so great that it is far easier for the current to split up in a number of paths and enter through the building than to confine itself to the rod.

"How many rods should be used?" The answer is, the more the better. The protection afforded ought to be, roughly speaking, proportional to the number of earthed rods. Half a dozen ground connections to a house 100 feet by 50 feet seems nothing out of the way.

How should they be placed? They should always be placed outside of the building and it is indeed a question whether the vertical part of the system, that is, the rod proper, should not be some little distance from the wall and possibly even insulated therefrom. The rods should be a considerable distance from gas pipes, stove pipes, water pipes and balconies or places where persons might be during a storm.

A small house might be protected as shown in Fig. 1. There are five or six ground connections, one at each corner and one or two from the chimney. A horizontal rod follows the ridge of the roof and is connected to earth by the several ground connections.

Heated gases coming from a chimney are apparently themeslves good conductors, or more probable are instrumental in collecting and forming a path of charged particles constituting good conductor for lightning discharges. It seems conservative, therefore, to have a metal conductor crossing over the chimney opening. Such a conductor should be made of copper on account of the chemical effect of fuel gases on iron.

Two small spires each having many points are shown. These are unquestionably of some advantage in that through them there is a continuous equalization of the potential between cloud and earth. It seems, however, as if their height should be conservative. A projection of a few feet seems quite enough. To be effective in their office these spires should have several points; but the expense of using platinum or something similar seems hardly warranted, because the amount of current radiated from the points is significant before the "brush discharge" begins, and when such discharge takes place it matters little whether the points are rough or sharp.

Each tower or other projection of a building should have direct ground connection, though connected with the other lightning-rod system.

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* By Ernest J. Berg in the Engineering News.

In Fig. 2 is shown an unsatisfactory arrangement of rods. A small dormer is supposedly protected by an independent short rod connected by a long wire to the main system. It seems unlikely that the discharge would travel many feet to reach the main rod when by striking through the building it can reach ground in most cases with greater ease. The attic room, supposedly protected, is endangered by the rod. Protection would, however, result if the dormer rod were directly grounded.

Metal gutters should be connected to the lightning-rod system and should be connected at their lower extreme to ground.

A high factory or power-plant chimney needs good protection; two or three rods do not seem too many and the opening of the chimney should be crowned by some simple copper-rod construction.

"What kind of material should be used?" In cities, where after all the damage by lightning is small, there is always more or less fuel gas and soot in the air and copper seems best. But there is no electrical advantage in having a stranded cable—a solid rock is as efficient. There is a very slight advantage in a flat ribbon, but the advantage is very small and the mechanical difficulties with a ribbon are greater than with a rod.

In the country, galvanized-iron rods seem best for two reasons: (1) They are cheaper; (2) their electrical constants are, if anything, better than those of copper.

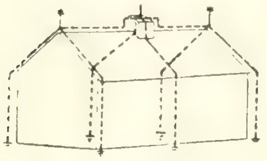


Fig. 1—Satisfactory.

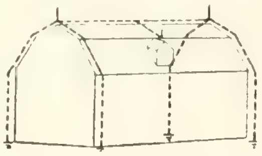


Fig. 2—Undesirable.

The old idea that the rod carries the electric charge to earth and that that is the end of it is fallacious. The earth is one plate of the condenser, the cloud the other, and whatever energy is stored between them has to be consumed in some way. It is done by heating the rod and by sending out electric radiations. The higher the resistance of the rod the greater is the energy converted to heat, and thus the smaller the number of oscillations of the discharge current necessary to dissipate the energy. Iron has considerably higher effective resistance than copper, and thus has an advantage.

Lodge's experiments and theory show conclusively that there is no advantage in copper over iron. Copper may have mechanical advantages under certain conditions, for instance in cities where the atmosphere is charged with soot and a variety of fumes. Galvanized iron has the advantage of cheapness, with a possible electrical superiority.

"What should be the shape and size of the rods?" While flat conductors have a very slight advantage, it appears too small to be considered seriously. A round wire or a pipe can conveniently be handled and seems therefore preferable. In the installation of the rods, sharp bends should be avoided as much as possible. There is little or no advantage in using large expensive copper conductors or cables. A size mechanically satisfactory is likely to serve all electrical purposes. Expensive sharp points offer little advantage over ordinary rather blunt points. The rods may advantageously terminate in a number a points projecting only a short distance above the part to be protected.

"How should ground connections be made?" They should be of low resistance, and therefore the rods should preferably terminate in moist soil. "Salting" the ground may be an advantage, but the experience with such grounds is not sufficient to warrant its adoption unless an occasional inspection is made. In many cases excellent connection can be made by driving a galvanized gas pipe a few feet in the ground.

"Should water, steam and gas pipes in the building be connected to the rods and grounded?" This is debatable. On the whole it would seem most conservative to leave them alone, especially the gas pipes. The water pipes, which are always grounded, may, however, advantageously be connected to the lightning-rod system under ground.

"Is it dangerous to stand in a draft during a thunder-storm?" A building having its windows and doors open certainly affords a chance for the entrance of air, perhaps ionized air made conducting by a previous discharge. It is, therefore, safer to keep the house closed during a violent storm.

"Is it safe to stand near a lightning rod?" From the preceding discussion this seems hardly safe. It is well to keep away not only from the rod, but from chimney, kitchen ranges, metal pipes, etc.

It is finally of interest to draw attention to the fact that the damage by lightning in cities is relatively small and that so far the modern sky scraper with its vast amount of steel appears to be lightning proof.

Surface-Oiled Roads in the Phillippines

THE use of a surface treatment of oil on the macadam roads of the Philippines is reported in the "Quarterly Bulletin" of the Bureau of Public Works as proving satisfactory even under comparatively heavy automobile traffic where proper attention has been given to the methods of application of the oil. Experiments have been conducted on small areas for some time and a study of the results of previous practice has led to several changes. Oil was applied to about 4½ miles of the Manila-South Road last January. Preparatory to the surface treatment of oil the road was broomed, but only the finer portion of the material was removed. No water was applied, as was done before, and the oil, spread in quantities approximately ½ gal. per square yard, was allowed to stand from thirty to seventy-two hours, until the surface was dry, before being covered with dredge-run gravel. Previous practice had been to cover it with sand from three to five hours after the oil application, and in this way much of the binder was absorbed by the sand covering and thorough penetration of the road base was prevented.

It has not been found necessary to use road rollers after the gravel has been spread, as the local traffic seems to consolidate thoroughly the binder and the surfacing. Previously the asphalt-like surface was oftentimes too thin to stand the traffic and would break through after a few months of use. Now there is no dust raised by the fastest moving automobile.

The Canadian Pacific Railway have completed their high-level bridge across the Saskatchewan River, from Strathcona to Edmonton, at a cost of slightly over $1,000,000.

The Layout, Design and Equipment of Industrial Works

By A. Home Morton

INDUSTRIAL works design is a special branch of applied engineering. It is not merely the design of the structure, of the power plant, or of the works equipment; it is all of these and more. It is the correct correlation of the human, mechanical and financial equipment of an industrial undertaking, and involves consideration of every problem which may arise from the conception to the realization of the scheme. No one is better fitted to study these than the engineer. A sound technical training combined with a keen insight into international industrial movements and the faculty of observation, are his basic qualifications.

Industrial engineers may be either professional designers, serving directly the interests of their clients, the principals in the scheme, or manufacturing designers selling their experience and manufactures to those principals. In either case the energies of the engineer-designer are essential to the birth of every industry, and his services to its continued progress. It is but reasonable, then, to expect that the creation of a new industry, or the organization of one already existing, ought to be first of all committed to the experience of an engineer-designer, either professional or manufacturing, and certain that command of this experience, when available prior to the inauguration of the industry, is of value infinitely beyond its cost. It is beyond doubt, also that these services must be paid for whether obtained from a manufacturing designer, or from a professional designer.

GENERAL CONSIDERATIONS

The stress of competition in modern industry demands efficiency with economy in every department. Industrial engineer-designers are, in consequence, frequently called upon to supplement estimates of the capital cost of a projected undertaking with estimates of the working costs, maintenance, and even of profits.

These demands in proprietors' interests, are, under certain conditions, legitimate and desirable, and the engineer-designer must be able to satisfy the proprietor with such estimates, accurate to within a moderate percentage. Careless estimating ought to be inconsistent with professional honor.

No practice is more to be condemned than that of encouraging proprietors to launch a scheme upon ill-considered and illusive estimates. An industrial undertaking is essentially an investment in which it is proposed to sink capital, perhaps the savings of private individuals, or, it may be, public moneys. Nothing then, ought to be permitted, either in the initial financial arrangements, or in the design of the scheme, which may, in the slightest degree, handicap its future chances of success.

Marketing a Profitable Output.—The first consideration should not be what capital can be secured, but what immediate output can be profitably marketed. This having been determined, the data ought to pass into the engineer-designer's hands to be worked up, and, in due course, be presented as a completely designed scheme for consideration by proprietors and their managers. From this design, embodying the works buildings, the works equipment, the power plant, and the area of site necessary, the several sectional costs and the probable total capital cost, can be determined to within a small percentage of probable error.

From these preliminary figures, the capital sum to be set aside for the works site can be estimated and available sites considered. Rough block plans of the works should be laid down upon the plans of the likely sites, and their merits and demerits should form the subject of a preliminary report, with special reference in each case as to:—

(1)—Labor, raw materials, and accessibility to markets.

(2)—Water, fuel, and other supplies.

(3)—Areas for storage, refuse dumping, and particularly extension.

(4)—Probable ground charges, rates and taxes.

To overlook any of these factors may prove a serious handicap to the future of the industry.

From these considerations it should be possible to fix upon the most convenient site, and immediately thereafter to form a close estimate of all costs, and draw up a complete general arrangement plan of the future works. This general arrangement may later be modified in detail, but it ought to be so complete and so carefully prepared that proprietors and their officials will be clear as to their liabilities and the works arrangement before anything has been spent on permanent works.

LABOR AND LABOR CONDITIONS

Due consideration of and for the worker is now being accepted as a sound business policy rather than as a mere economic idea or fad. The law of the land is becoming more stringent in its demands for the health and convenience of the workers. There is a tendency towards improved labor conditions and the reduction of physical drudgery by the introduction of aids to labor.

It must be clear that in order to secure not only quantity but quality of output, the interest and skill of the worker and the perfection of equipment must be alike maintained unimpaired. In engineering works, where modern methods hold, experts are employed who devote their energies to the regulation of the feed and speed of the high-class tools now generally in use, yet there is far too frequently in parallel with these efforts a marked lack of attention to the conditions of labor. Apathy among a body of workers, whether due to physical or mental depression, in consequence of unsatisfactory conditions, or discontent from any cause, may easily prove a far more serious loss to the management than even inefficient mechanism. Industrial efficiency cannot be expected unless the human and mechanical factors in the works equipment have both their maximum value. It is most important, therefore, that the labor conditions should receive attention equal at least to that bestowed upon plant and equipment. Consideration for the workers does not involve extravagance either in design or equipment, and, when judiciously carried out, yields a fair return.

If an industrial undertaking is to take its proper place in the international competition of to-day, it must be the subject of careful preliminary consideration, so that it may finally take shape as a well-designed and well-equipped works, complete with all necessary plant and fittings, properly situated in regard to its raw material and market, having a sound commercial organization and management, and provision for the health, comfort, content, and even education of its workers. Under these conditions it may be expected that there will be willing co-operation between employer and employee, and, if the existence of the industry can be justified at all, financial success.

GENERAL ARRANGEMENT

Successful general arrangement of industrial works presupposes practical acquaintance with the manufacturing process, and with the works plant. With this knowledge and his own special training, the engineer-designer should be able to build the works on paper and to see them in his mind's eye with every stage of the process in operation before the ground is broken.

It is also essential that the design of the buildings, the steel structure, the power plant and transmission, and the arrangement of the process plant should proceed simultaneously. Indeed, in the case of the two latter sections, it is essential that they should be considered in parallel. It is quite a common practice to have these separate sections designed by separate people and assembled under the supervision of the principals and their officials, but it seems almost needless to urge the advantage which must accrue if these can all be carried through under the direct supervision of one individual.

Influences Affecting Works' General Arrangement.—A works' general arrangement must be considered, first, with reference to the character and quantity of the output, and the limitations and disabilities of the site. Actual works designed to produce the same commodity on sites of varying form are found on examination to have similar essential areas, even although they may differ somewhat in arrangement. A relationship obtains between floor area and output which holds for average conditions over a considerable range in magnitude. To illustrate, the average percentage floor space in each department of four engineering works producing a similar commodity and in approximately equal quantities was noted to vary between ¼ per cent. and 3 per cent. as between the maximum and minimum percentages for each department. This gives to the designer what may be called an approximate formula for departmental areas in such works. In a similar manner, areas for yards, storage and refuse, can each be reduced to fairly correct relative values. These areas should, of course, be ratios of the total site, although only that portion of these areas required for the immediate output should form the works proper initially, the remaining area being left for extension. A well-arranged scheme of extension should form part of every original design.

The first essential to a general arrangement design is the "process diagram" and the second the "routine diagram."

The Process Diagram.—This is simply the enumeration in tabular form, or the graphical presentment of the several works processes. For example, in paper mills, the several processes are: sorting and cutting, dusting, washing, breaking, bleaching, beating, coloring, paper-making, drying, sizing, and glazing. When to a graphical diagram of a process of manufacture is added a complete schedule of the areas required to house the machines necessary to produce a given output, then a complete "process diagram" is the result.

From the process diagram and the basic areas already mentioned, the engineer-designer, with an intimate knowledge of the whole process of manufacture, and of the machines necessary to accomplish the process in each particular section, may proceed to prepare the "routine diagram."

The Routine Diagram represents graphically the flow of work in process. In preparing this, the following axioms should be kept clearly in view. Works should be so arranged that the material dealt with and manufactured shall flow through them in an orderly manner, in one direction, as far as may be, and without waste of time, energy or material.

The routine diagram is probably the most difficult part of works design. It involves the sequential arrangement of the machines within each department, and there after the laying out of the departments relative to each other. To carry this out successfully requires great skill and care, and probably much tactful discussion with the proprietors, managers, and foremen of the proposed works. From the detail data available, however, suitable approximate linear dimensions and heights for buildings may be fixed, and thereafter the manipulation of these blocks may proceed until the most satisfactory relative positions of departments are secured.

The routine diagram is complete when the several departments are arranged on paper, and the flow of work in progress through the departments is as nearly as possible perfect. The first design is rarely final. A large number of block plans, each having advantages, may require to be prepared before even a measure of satisfaction is reached, and the final plan is usually an amalgam of the leading features of several of the draft plans.

It may be said that this work could be done by the works proprietors or managers. Experience shows, however, that a good manager is not necessarily a good designer of works, even for his own trade. Every man works most efficiently when on the work for which he has been trained. Better then for the manager to take time from his own work only to point out briefly his requirements and the peculiarities of the trade or process to the engineer, leaving him to meet the requirements and solve the problems. There can be no doubt that an engineer-designer, skilled in this particular class of design, can, with very beneficial results, bring a fresh mind to problems, the solution of which may have become stereotyped, and import useful ideas from other trades which have come under his wider range of practice.

Power Transmission.—The transmission of power, like a great arterial system, conveying life to every department, is an integral part of the whole scheme, and it must be considered from that standpoint. If this be not done, then it may be that, instead of being so compactly arranged as to permit of direct driving by means of a single steam or gas engine, the works arrangement may be such that only electrical transmission (frequently misused to cover bad design) can be satisfactorily applied. The requirements of the power transmission system may sometimes modify the general arrangement, but in most cases, the method of power transmission will be fixed by the requirements of the general arrangement.

Transportation.—Other important factors bearing upon the general arrangement of a works or factory are railway communication lines, internal transport of materials, and general auxiliary equipment. The railway communication lines should be simple and economical in arrangement and at the same time adequately serve each department, provide suitable sidings, package, and storage lines, and yet maintain adequate through communication to all departments.

Entrance siding lines should, wherever possible, permit of the passage of a main-line freight locomotive to the more important section of the works, and where this is impracticable ordinary car sidings, served by a dummy engine, having a short wheel-base may be accepted. The means of internal transport may be by travelling cranes, power runways, hand runways, or bogie trucks, with or without tracks. All have their particular spheres of usefulness, and care bestowed upon their selection and installation is of value, since they are among the more important labor-saving appliances within a works. External transport, other than by railway lines, may be by overhead travelling cranes upon gantries, by travelling gantry cranes upon railway tracks, by locomotive jib cranes, by power runways or by cableways.

Auxiliary Equipment.—In addition there is a large assortment of what may be termed "auxiliary equipment" to be considered in parallel with the works' arrangement, such as water supply from bore well, river or local system, with probable treatment plant and filtration for works and boiler service and for drinking purposes; fire service, usually an independent ring water service, probably interconnected with some fire appliance of the sprinkler type; drainage divided into two sections, foul drainage direct to the local sewage system or to an independent treatment plant, and surface water, if pure, directly connected with the condensing plant and cooling pond; lighting, by electricity, high-pressure gas or oil gas; repair shops and tool rooms, stores, offices, and men's rooms, and many other minor departments.

POWER GENERATION AND TRANSMISSION

The subject of power generation and transmission in industrial works has been frequently and exhaustively treated in recent years. Tests have been made and comparisons drawn to prove the superior economy of practically every type of power plant and every transmission system, and it is true that after a full and impartial consideration of the relative merits of the three more important transmission systems, with reference to a particular works, it may be necessary to admit that each of them has some superior merits.

An interesting side issue bearing directly upon this question may be noted. The shop costs in a number of manufacturing establishments in the engineering and allied industries have been analyzed, with the result that the cost for power is shown to be only from 2 per cent. to 5 per cent. of the total cost of manufacture. This is a most important point. In other industries the ratio of the cost of power may be much greater or even less, but, in certain manufacturing establishments, a quite legitimate conclusion may be that the influence of power costs upon manufacturing costs is so stifling as to be nearly negligible. The narrow margin may on the other hand mean all that there is between profit and loss to the manufacturer. These facts lend weight to the statement so frequently made, that reliability, flexibility, and adaptability to the needs of the worker are more to be sought after in a transmission system than simply economy of operation. It is certainly true that a very modest reduction in the labor costs in most works, due to increased manufacturing facilities, may represent a handsome percentage, if not the whole, of the cost for power. The expansion which has taken place in the applications of electricity in industrial works has further proved that this aspect of the case exercises an important influence on the minds of manufacturers.

The following general statements are subject to modification under particular circumstances.

Each system of power generation and transmission has its particular advantages and superior economy, and maximum economy in works driving in a particular case may be obtained by a combination of two or more systems. The difficulty is usually not so much the selection of the system as the determination of the extent to which it should be utilized.

Dealing first with transmission systems. Where the plant is compact and conveniently arranged within a radius of, say, 100 or 150 ft. from the central power plant, mechanical transmission is most economical, while, with an increased radius, gas or electrical transmission has advantages, the former being the most enticing system from the point of view of thermal efficiency, but meantime having a more limited application. Where tools are set widely apart, electrical transmission with independent motors is economical, although where it is possible to have a group of tools in a works, an independent gas engine or electric motor driving these through gearing is more economical than independent motors.

Where the amount of power required for individual machines is small, it is almost always advisable to group them. By examining the published descriptions of the electrification of several large engineering and shipbuilding establishments, it will be found that the average size of motor is steadily rising.

The question of reliability and consequent need for stand-by plant is also important. Practically any one of the systems, if properly installed, can be regarded as reliable, but the subdivision secured by the use of motors or small gas engines has advantages.

The chief advantages of the electrical transmission system are its adaptability and the ease with which it can be extended, and its chief drawback is its cost, a part of which, at least is due to the refinements which have been introduced into electrical controlling and operating mechanism.

The question of transmission, depends for its solution upon the conditions of service. Where the power demand is very intermittent, purchased electrical energy has advantages over all other systems, although for dock pumping, slipway haulage, and other heavy intermittent loads, gas engines, using city gas, are very economical in use. For a moderately steady demand up to about 100 to 150 B.H.P., the suction gas engine has no rival. Above this load it is possible to purchase steam plants using highly superheated steam, which can generate one I.H.P. per hour, at a fuel cost of little over 1 lb., and a steam cost of approximately 8½ lb.

Where an electrical transmission system has been decided upon, the purchase of current demands first and most careful consideration. If a private plant is decided upon, then the generators may be either steam or gas-engine-driven. The units, in the case of gas-engine-driven generators, may be of practically any size desired, while steam-engine-driven units may be reciprocating engines up to 750 kilowatts, and steam turbines thereafter. Interesting results can be got from the combination of reciprocating engines with steam turbines, a combination of this character giving a wide range of economical load at a modest capital cost, this advantage being obtained by cutting out the turbine from the lower loads and exhausting direct from the reciprocating sets to the condensers.

The sphere of usefulness of the large power gas engine is confined mainly to situations where so-called waste gas can be obtained, as at coke ovens and blast furnaces, or where chemical plant already is installed. Where waste gas is available, the large-power gas engine is in many ways desirable.

DESIGN AND CONSTRUCTION OF THE WORKS STRUCTURE

It might be argued that the design of the works structure—that is, of the buildings and sheds, should be left in the hands of an architect. Works buildings, however, are designed in the first place to withstand the special stresses to which they may be subjected in service, and effectively and economically house the machinery and power transmission plant. Detail consideration of these matters does not enter into the architect's training. For this reason the design of industrial works and factories, in all its details, ought to be left to the engineer-designer with the proviso that he is not at liberty to perpetrate an offence to the public eye.

The essential feature of all industrial design should be simplicity, utility, and efficiency, combined with low first cost and durability. These features should be apparent, whether in the design of the power plant, of the electrical installation, or of the structure. The simplest manufactured details readily procurable from stock ought to be used for all details, unless these are quite unsuited to the purpose of the designer. Steel structural work, even more than builders' work, ought to be characterized by simplicity and well-placed material. Artistic or eye-pleasing effect can always be obtained by correct design, carried out in suitable materials on well-balanced and simple lines, carefully arranged and well-proportioned, without useless and meaningless ornamentation. Nothing can be truly artistic or eye-pleasing which violates the principles of design, or misuses material.

Formerly, works had massive stone walls and timber roofs. To-day the steel structure has displaced the older materials almost completely. In factory construction, reinforced concrete is coming more into use, and some very beautiful structures have been erected in reinforced concrete with brick filling; this class of construction, especially where brickwork is also reinforced, is particularly satisfactory.

The question of economy in first cost may have greater influence on the class of construction than is warranted, and may lead to the adoption of timber. The cost of maintenance and the fire risk with the ordinary form of timber construction, combined with the relatively shorter life, are strong influences against its adoption. Granting, however, that an all-timber, or brick and timber structure is lowest in first cost, then an all-steel construction, with corrugated iron sheeting, is next in order of economy, while brick and steel construction is usually rather more expensive.

For a permanent factory or works, however, where a manufacturing process is to be carried on under shelter, a steel structure with brick walls, either built or filled, is almost universally adopted where the manufacturing process is of such a nature that absolute protection from wind and weather is not of first importance.

Stresses on Buildings.—With travelling cranes and shafting, the consideration of internal stresses is important, because any excessive movement in the structure will bring about shafting troubles, and any lack of rigidity may quite easily have a serious effect upon the operation of travelling cranes. The stresses due to the stopping, starting, and running of high-speed travelling cranes are very considerable. A point frequently neglected, in designing sheds where cranes are in use, is effective diagonal bracing of the structure to prevent racking, through end-travelling on the one hand and cross-travelling on the other.

The external forces to which an industrial structure may be subjected are wind and snow loading. Generally speaking, if a structure is designed to resist the side and roof stresses from wind loading, and to have a fair margin of safety, any snow loading which may arise can be neglected. A very great deal of work is being put up, even to-day, which can only be said to withstand the wind stresses to which it is subjected by courtesy of an indulgent Providence, and, on the other hand, there is a large amount of work being made of an unduly extravagant character. A well-designed roof-truss, having its ends thoroughly connected to the roof girders, having good spreading plates, moderate purlins, and a corrugated sheet roof well and properly laid, must by itself, by virtue of the continuity of the roofing, be a reasonably well-braced structure. The value of a roof, whether of timber or of corrugated iron, as what might be termed wind bracing, is considerable, and given sound end connections it is somewhat difficult to see the reason for the adoption of an elaborate system of longitudinal or diagonal wind ties across the lower members of the roof frames.

In buildings in which there are cranes, the area between the main pillars and under the crane beams may be left quite clear, since if the pillars are stiff enough, and their strength is carried through on the top of the crane beams, and if, in addition, a moderate amount of diagonal bracing is introduced above the crane rail level, then the upper part of the structure between the crane and roof girders virtually becomes a deep lattice, having the crane girder as its lower member, the roof girder as its upper member, and the continuation of the pillars carried up to take the roof as its end members, the lattice bracing filling the intervening space. With such a structure, the resistance to the heavy stresses set up by the travelling cranes is usually well provided for.

In general with long spans, if bracing is carried down in a vertical plane from the lower member of the roof tie to the roof pillar, and sideways in a horizontal plane from the same lower member to the roof girder, these diagonal connections tune up the whole structure in a reliable manner.

Under the industrial conditions which hold to-day and are becoming increasingly stringent, no manufacturer building or reconstructing works or mills can afford to neglect the technical skill which is at his disposal, quite irrespective of cost. It may be argued that a works manager or proprietor knows most about his business and its needs. But it can quite legitimately be argued that the proprietor's business may be the mining of coal, the manufacture of iron or steel, of ships, of chemicals or of textiles. In that sphere he works at his best, his efficiency is a maximum. In the design of buildings, the selection of power plant, or even the economical arrangement and correlation of these, he is at a disadvantage.

Whether this disadvantage is serious or may only involve a permanent tax upon his business, when accepted, must be left to his own judgment. The author merely calls attention to the fact that those industries which hold a world-wide reputation in America, in Germany, and even in Great Britain, have in every instance had the advantage of being originally designed or reconstructed at some point in their recent history by experts in collaboration with engineering skill either manufacturing or professional. As already pointed out, the skill and energies of the engineer are essential to the birth and growth of every modern manufacturing industry.

Painting Cement

THE painter of modern times, when called upon to paint a cement building, naturally stops to give the matter his most serious thought, taking into consideration the various factors which would have some effect upon the life of his work. The porous property of the cement makes it a material which absorbs water readily, and in a rainstorm the walls of cement buildings soak up large quantities of water which sometimes makes the buildings very damp and unhealthy. This trouble, of course, will be overcome if the paint used is a good one, and is properly brushed on. If the foundations of the building are of cement they have probably been waterproofed on the outside (below ground) with hot coal tar of gas pitch swabbed on in thick layers between alternate layers of tar paper, or with some specially prepared waterproofing solution. This waterproofing of the under structure is generally done by the cement masons, and if properly carried out will give assurance to the painter that the walls above ground will not be troubled with any water, which might, under a head of pressure, push through untreated side walls and work up into the exposed part of the building.

Style of Finish Must Be Considered

The style of exterior finish of the building to be painted is also a factor which demands the painter's special attention. Some of the finishes used today are termed rough sand finish, floated surface, smooth trowelled surface, and pebble dash. These different finishes absorb different amounts of paint, and the painter must, in making his estimate of cost, make a test to determine the spreading capacity of the paint that has been selected for the job. This can be done upon a small area of the building ten feet square (100 square feet). The amount of paint required to cover such an area, either one, two or three-coat work, can then be used in calculating the amount of paint required for the whole surface of the building, the area of which should be carefully measured.

The time required to paint the 100 square feet of the test area should also be taken, as the painting of cement requires a much longer time than the painting of wood. This is due to the porous nature of the cement, every little surface pocket of which should be filled with the paint. With the information gained from such a test, the painter can make a safe estimate of the cost of the work. The painter who considers it unnecessary to make such a test and who bases the cost of painting cement entirely on guesswork or upon assumption that it is the same as painting wood, is apt to find himself doing the work below cost.

Cement buildings which are allowed to remain unpainted for a year or so, present the most satisfactory surfaces, as the action of the weather upon the cement makes it thoroughly hard and practically free from salts, which might prove destructive to oil paints. Sometimes, however, the painter is called upon to paint cement buildings right after the cement is set up and in a green condition, even before it has had a chance to become thoroughly hardened. In such cases the application of paint is apt to turn out badly, as the alkaline salts in the cement will be carried out by the water present, to the very surface upon which the paint is applied. The paint may then become streaked and scale off. These conditions were described by Charles McNichol, a painter who read a paper on the subject before the International Association of Master House Painters. He stated that the use of a twenty-five per cent. solution of zinc sulphate could be brushed on a damp wall of fresh cement, and that this treatment will entirely neutralize the alkaline salts and put the surface of the cement in excellent condition to be immediately painted with a good paint. This method has been worked successfully on many buildings, and its author is to be complimented upon having given his brother painters the benefit of his knowledge and practice.

Effect of Alkaline Salts

Walls or surfaces of new cement buildings often show white patches where the alkali salts are concentrated. It is over such spots that the fading of cement paints is first shown, and the safest way to prevent such trouble when new cement walls are painted, is to treat the whole wall previous to painting, by the above described process or some similar process which has been carefully tested.

Heavy varnish should not be used as a size for damp cement walls, as it makes a thick film that will not let the water out, and peeling in whole sheets would probably follow such a method. This leads to a feature of the subject which is most important. A cement paint to be efficient must provide for the escape of any water or moisture in the cement, otherwise the water will be drawn out when the cement becomes warmed by the sun and the paint will blister and peel. A dull finish paint such as the painter would produce by thinning a good cement paint with turpentine or naphtha, is generally preferred on cement walls. Such a paint would make the surface sufficiently moisture-proof and would not form a coating that would prevent the exit of moisture from cement. Although white paint is mostly used upon cement, any good permanent color may be used, especially if the surface is first washed, as previously described.

Lime-proof colors are now used for coloring the best grades of cement paints, thus making the paints unfading, even when painted upon cement walls containing lime.

Fire Hazard of Floor Openings

The fire hazard of floor openings to accommodate belt or rope drives has not been as fully appreciated as the safeguarding of vertical openings through floors at stairs and elevators by placing them in towers well cut off from the remainder of the building. The protection of belt openings has been handicapped by the lack of a construction suitable for use in mill buildings where the belt or rope towers were not provided for in the original design. Partitions of expanded metal and cement construction, 2 inches or more in thickness, have been found well adapted for the inclosure of such main drives in existing buildings. These cement partitions, it is said, can be installed at a cost not greatly in excess of combustible forms of construction.

The Decorative Value of Tile Flooring

Opportunities Afforded the Designer and Setter—Possibilities of Variety in Pattern and Elaboration—Importance of Joints

By A. B. LeBoutillier

TILE floors have a practical value; they also have great decorative value, and it is with the latter that we are at present concerned. Owing to the peculiar limitations of the material and the methods of manufacture, tiles are necessarily small units. To cover a large surface with these units, obviously requires numerous joints. Therefore, the joints, as well as the tiles, should be given importance in the design. From a designer's point of view, the limitations of a material are its greatest asset, each material requiring its own peculiar treatment.

Not many years ago, all the tiles that were available for floors were of the machine-made variety, so perfect in workmanship that they could be laid in a floor with joints of a hair's breadth. These tiles were made in a variety of shapes and colours, but it was useless to lay out a pattern in one colour, because the pattern of the joints could not be discovered without close inspection. If pattern was to count, it was necessary to use colour, and the effect was generally hard, dry, and uninteresting. Conditions have since changed, and we have come to realize the value of the joints. It is seldom necessary to lay a floor of plain tiles with joints less than one-quarter of an inch in width. Whether these joints are left the natural colour of cement, or are coloured, they will always count in the design, and the slight unnevenness of the tiles themselves will give a texture that is not as hard and uninteresting as the floors of mechanical perfection.

The character of the building and the location of furniture and rugs affect the design of the floor. If the floor is in an important room of a monumental building and is free from large pieces of furniture, it may well be treated so as to be in accord with the architectural treatment of the walls, but if there is to be much furniture and many rugs on the floor, it is better treated as a whole. This is a point that is often lost sight of in railway waiting rooms and restaurants.

Church floors afford as great an opportunity for tile work as the windows do for stained glass. Much could be said on this subject alone, but it is sufficient here to make the following observation: The nave aisles should be simple, the choir somewhat more elaborate, and the sanctuary very rich in pattern, symbols, and colour. In short, the elaboration increases as the altar is aproached.

It is not necessary to use large tiles in a large room to get scale, as the tiles can be arranged so that the unit is composed of several small tiles, and the scale of the pattern increased or reduced at will.

It is not essential that all the tiles laid in a floor come from one factory. Herein has the tile setter great advantage, especially in coloured tiles. In the matter of shapes and designs, clay is so easily moulded that there is almost no limit to the variety that the smallest factory can produce. It is in the matter of glazes and quality that manufacturers differ.

There are many patterns that have been common property ever since the beginning of tile making, and are to be found, with slight variations, in many tile manufacturers' lists. New designs can be readily produced and old ones revived; the process is simply a model in clay or wax, from which a plaster mould is made, then the clay pressed in by hand, removed from the mould, dried and baked; a simple primitive process, to which tiles owe much of their charm. The difficulties are in composition of the clay and glazes; these, of course, it is assumed, have been overcome by the manufacturer.

The ideal method of designing a floor is to arrange a general scheme and then lay out the details on the job, changing and rearranging details as occasion arises. This, of course, requires an artist as a workman—and there are such—or constant supervision. This is not always possible, but when it is done, the result is spontaneous, and free from the mechanical look that might come from a hard and fast plan laid out on the drawing board.

By the use of colour in pattern, and pattern in individual tiles, there is almost no limit to the richness and elaboration possible for tile floors, but on the other hand, it is also possible to make an interesting floor of plain tiles in one colour by taking advantage of the joints.

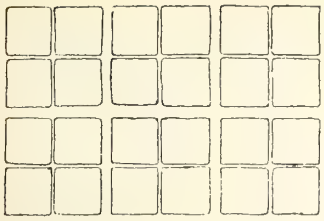
The diagrams will serve as reminders that the joints are of equal importance with the tiles.

Excavation Under Water

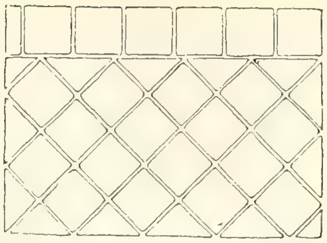
Heavy submarine excavation will be required for the Government dock at Vancouver, B.C., for which appropriations sufficient to cover the first year's construction have already been allocated. The new dock is to cost between $1,500,000 and $1,750,000 and is to be completed within two years. It will be 800 ft. long and 300 ft. wide, and the berthing slips on each side will be 140 ft. wide, dredged to a depth of 36 ft. at the lowest water. It will be necessary to excavate about 125,000 cu. yd. of material below low water before actual construction can start. Solid rock in excess of 100,000 cu. yd. will have to be drilled and blasted under water, it is said, in depths varying from 5 to 36 ft. When the excavation is complete twenty-three large timber cribs are to be built in drydock, sunk at the required points and then filled with broken rock. On top of these cribs a sawn-timber foundation requiring 11,000,000 ft. b. m. is to be laid and topped off with a layer of concrete. Upon this composite foundation a retaining wall is to be constructed.

Architects Commend Brick

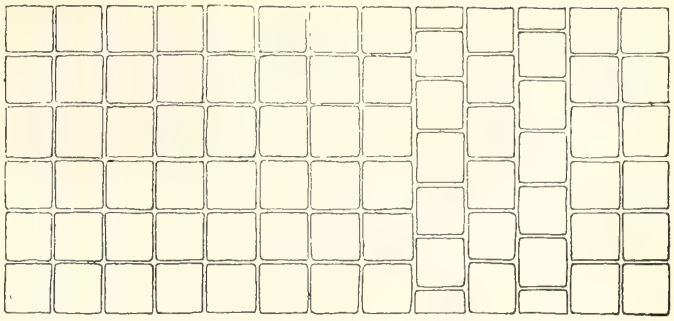
After exhaustive research and thorough investigation including the severest fire and water tests that could be applied to building construction, we do not hestitate to say that brick work far surpasses any other form of construction work known to science. Either structural steel or concrete measures up to commercial tests, or originally known, but where these materials have been subjected to extreme heat and streams of water have been applied to buildings constructed of these materials, under these conditions, the results have been disastrous.—Year Book, American Society of Architects.



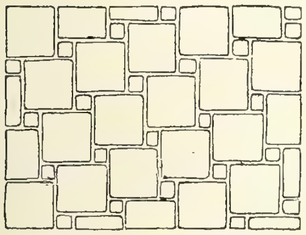
By groups of four squares as a unit separated by wider joints, the scale is increased.



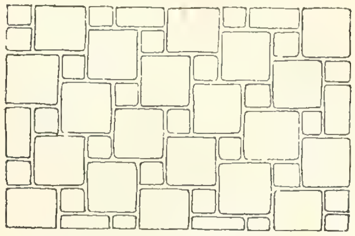
A diagonal pattern of square tiles is emphasized by a border.



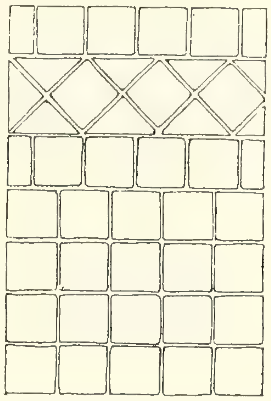
By a few rows of broken joints, an effect of border is produced in a field of square tiles.



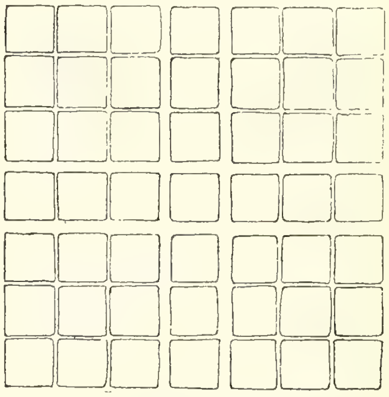
When the small squares are less than one-quarter of the area of the large squares, the pattern runs off at the side.



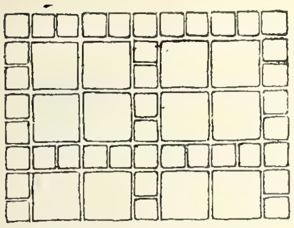
When the small squares are one quarter of the area of the large squares, the pattern has more repose.



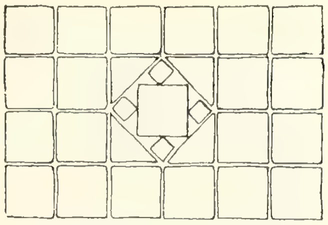
By breaking joints in one course, the border is made wide.



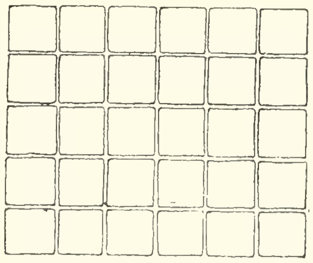
An arrangement adapted to large rooms.



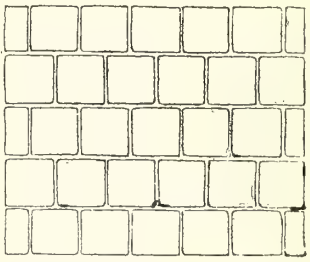
Another way to increase the scale with small tiles.



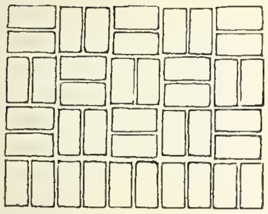
A decorative pattern that can be made on the job.



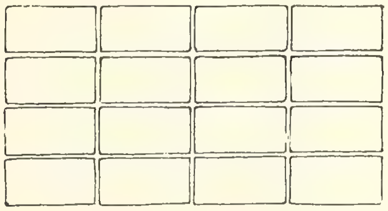
The simplest floor of square tiles is interesting if the joints are in scale.



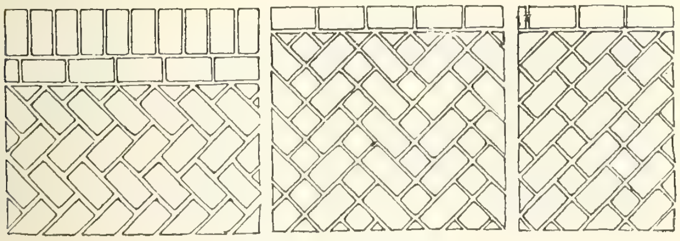
When square tiles are laid with broken joints, long lines in one direction are the result.



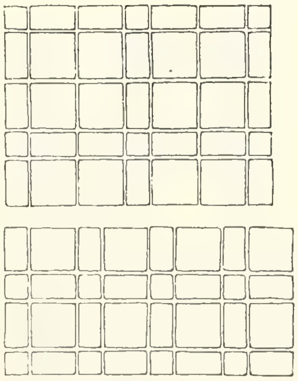
When double squares are laid "basket pattern," the necessary allowance for joints adds interest.



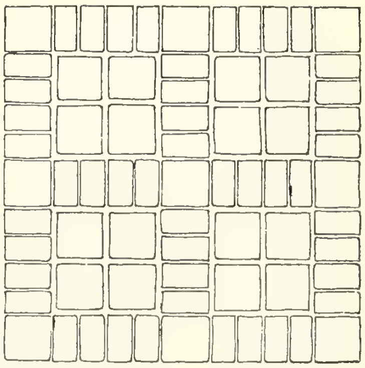
A good pattern for corridors.



Varieties of "herringbone."



Two combinations suggesting plaids.



A simple device for a panel or a floor for a large room.

THE DECORATIVE VALUE OF TILE FLOORING

Standard Specifications for Building Brick

With the time approaching for the annual meetings of the various clayworking associations in Canada, it is timely perhaps to present the following report which was submitted recently at the annual convention of the American Society for Testing Materials and held for further consideration:

At the twelfth annual meeting of the Society in 1909 this Committee, designated at that time as Committee D, submitted a report including some suggested specifications, which were offered for use but not intended, at that time, for adoption. The lack of accurate knowledge regarding the properties of brick, the methods of testing them, the relations existing between the properties which could be measured and their influence in the finished structure, compelled the Committee to refrain from any definite recommendations. This condition has continued during the succeeding years and little progress has been made. In 1911 the Committee was considerably enlarged and organized into two sub-committees, one on building brick, the other on paving brick. A program outlining a series of investigations was formulated and has through the co-operation of some of the manufacturers and testing laboratories progressed sufficiently to yield some reliable results. It is hoped that during the coming years a greater number of laboratories may become interested and assist in the collection of much needed data.

The University engineering laboratories and the laboratories of large companies have during the past twenty years devoted a large amount of energy and money to the investigation of steel and steel products; the new and attractive alloys; cement and cement products; and built-up members involving these materials in their construction.

Brick, the most extensively used structural material in the country, and ceramic materials, such as hollow tile, terra cotta, fireproofing and the mortars used with them, forms one of the most fertile fields for engineering investigation.

Building Brick

In the preparation of the following suggested specifications the Committee has felt that its chief aim should be to provide methods for contractual testing.

The numerical requirements included in the suggested specifications are therefore limited to those properties upon which the Committee has at the present time sufficient information to enable it to indicate reasonable values. The transverse test and the numerical values for the compressive strength after freezing and thawing have been omitted for the lack of sufficient data. The Committee recognizes the value of these tests and expects to obtain information on them during the next year. As a comparative test between different kinds of brick the transverse test may be considered as a modified tensile test to determine the cohesion of the materials and to form a valuable estimate of their relative resistance to transverse action in a structure when subject to uneven bearing, settling and temperature changes. It also assists in the determination of the effect of various kinds of lamination.

For the purpose of making comparative tests and for the proposed investigations of the Committee, the following methods are suggested:

Transverse Test

At least five brick shall be tested, laid flatwise with a span of seven inches, and with the load applied at midspan. The knife edges shall be slightly curved in the direction of their length. Steel bearing plates, about ¼ inch thick by 1½ inch wide, may be placed between the knife edges and the brick. The use of a wooden base block, slightly rounded transversely across its top, upon which to rest the lower knife edges is recommended. The modulus of rupture shall be obtained by the following formula:

$$R = \frac{3\ W\ c}{2\ b\ d^2},$$

in which c is the distance between supports in inches, b is the breadth and d the depth of the brick in inches, and W is the load in pounds at which the brick failed.

There can be no question of the far-reaching value of the freezing test since information of this nature referring to all of stone-like building materials is urgently needed. If the freezing test is desired, the Committee suggests the following method:

Freezing Test

At least five brick shall be dried as specified under "Sampling" below, weighed and immersed in water which shall be raised to boiling in not less than 30 minutes, boiled for 30 minutes and then allowed to cool between 60 deg. F. and 80 deg. F. The specimens shall be immersed in water below 40 deg. F. for not less than one hour, then transferred to the refrigerator and supported in such a manner that all be exposed. They shall be subjected to a temperature not above 20 deg. F. for at least four hours, then removed and placed in water at a temperature between 60 deg. F. and 80 deg. F. and raised to boiling. The freezing and thawing operation shall be repeated twenty (20) times, after which the brick shall be dried as before and weighed. The condition of the bricks shall be noted before and during the test and all visible changes recorded. If it is desired to express the loss of weight in percentage, it shall be computed upon the dry weight.

Classification

In attempting to establish values in the "Requirements," the Committee has been confronted with the difficulty of not only having to meet the numerous uses of brick but the wide divergence in various parts of the country on account of the different natural materials available for manufacture. The difficulty has been overcome by forming a classification which, it is believed, will meet these conditions.

SUGGESTED SPECIFICATIONS

Sampling

For the purpose of tests, brick shall be selected to represent the commercial product by an experienced person agreed upon by the parties to the contract. All brick shall be carefully examined and their condition noted before being subjected to any kind of test.

For the purpose of tests ten (10) brick will be required, which shall be thoroughly dried to constant weight in a suitable oven at a temperature of from 225 deg. F. (107 deg. C.) to 250 deg. F. (121 deg. C.).

Compression Test

Compression tests shall be made on at least five (5) half brick, each taken from a different brick. The half brick shall be prepared either by sawing or by breaking upon yielding bed with a sharp mason's chisel which shall be the full width of the brick. To secure a uniform bearing in the testing machine they shall be bedded in a thin coat of plaster of Paris, spread upon a plate glass surface coated with a thin layer of oil. The brick shall be pressed firmly upon the surface, making the layer as thin as possible, and remain undisturbed until set. Before applying the plaster of Paris, the bearing surface of the brick shall receive a coat of shellac. Recessed or paneled brick should be brought to full bearing surface by filling the depression with neat Portland cement mortar, which shall stand at least 24 hours before the plaster of Paris is applied.

The machine used for the compression test shall be equipped with a spherical bearing block kept thoroughly lubricated to insure accurate adjustment, and the adjustment should be made by hand under a small initial load. During the test the beam of the testing machine must be kept constantly in a floating position. The breaking load shall be divided by the area in compression and the results reported in pounds per square inch.

Absorption

At least five dry brick shall be weighed and completely submerged in water at a temperature between 60 deg. F. and 80 deg. F., the water heated to boiling within one hour, boiled continuously for four (4) hours, then allowed to cool in the water to a temperature between 60 deg. F. and 80 deg. F. They should then be removed, the surface water wiped off with a cloth and the brick quickly weighed. The percentage of absorption shall be computed on the dry weight.

Requirements

Class A.—Vitrified Brick. Average compressive strength, not less than 5,000 lbs. per sq. in.; minimum comp. strength of any specimen in test, not less than 4,500 lbs. per sq. in.; average absorption, not more than 5 per cent.

Class B.—Hard Burned Brick. Average compressive strength, not less than 3,500 lbs. per sq. in.; minimum comp. strength of any specimen in the test, not less than 3,000 lbs. per sq. in.; average absorption, not more than 12 per cent.

If subjected to the freezing test, they shall not show cracking or serious spalling in any of the bricks tested or serious disintegration of the material.

Class C.—Common Brick, First. Average compressive strength, not less than 2,000 lbs. per sq. in.; minimum comp. strength of any specimen in the test, not less than 1,800 lbs. per sq. in.; average absorption, not more than 18 per cent.

If subjected to the freezing test, they shall not show cracking or serious spalling in any of the bricks tested or serious disintegration of the material.

Class D.—Common, Second. (These bricks to be used only for backing up and for interior walls involving small loads.) Average compressive strength, not less than 1,500 lbs. per sq. in.; minimum comp. strength of any specimen in the test, not less than 1,200 lbs. per sq. in.

Miscellaneous

Any brick other than clay brick may be included in Classes A, B and C, provided they meet the specified requirements and when the freezing test is required, it shall not show cracking or serious spalling in any of the bricks tested or serious disintegration of the material.

Standards with Reference to Sewage Treatment*

By T. Aird Murray, M. Can. Soc. C. E.

WITHIN the last two or three years there has developed in Canada a strong desire to conserve the purity of inland waters by preventing the discharge of raw sewage effluents. Several provincial governments have enacted legislation making it imperative that any scheme for the sewerage of an urban district shall be accompanied by a scheme for the satisfactory treatment of the resultant sewage.

The engineer when called upon to make surveys and plans for a system of sewers finds that it is no longer the simple question of providing underground channels with suitable grades and a final effluent point into some stream, ditch or sheet of water forming the natural drainage level of the district, but that he has also to design some form of works or plant which will have the effect of so changing the character of the raw sewage that it will at least meet the requirements of a Provincial Health Department. Naturally the engineer before he commences to make plans for any particular design of sewage disposal works is inclined to ask the provincial authority to state what it expects and will insist upon with reference to degree of purification and manner of sewage treatment. The engineer is anxious to know that his efforts in preparing plans are based upon what may be accepted lines and that his scheme when submitted will not be rejected for non-compliance with certain standards of required efficiency.

The engineer is generally somewhat surprised to find that these provincial health authorities have no hard and fast rules with reference to any fixed standards applying to the question of degrees of purity of sewage effluents, but that the golden rule appears to be that there is no rule.

There appears to be sufficient evidence connected with the history of sewage disposal methods and administration to warrant the conclusion that it is impossible to adopt any general standard of required degree of purity, and that each case under consideration requires separate adjustment with reference to local conditions and requirements. The importance of the consideration of local conditions cannot be exaggerated, especially with reference to this country where we have certain conditions which are peculiarly inherent, and are not found to the same extent in most other countries where sewage disposal methods are in vogue.

The fact that certain methods and principles have been more or less adopted in Great Britain, Europe and the United States and found more or less successful, allows of no definite conclusion that such methods and principles will be equally successful in Canada. To take an example,—we find in Great Britain that the underlying principle which demands sewage disposal is entirely apart from any pathogenic consideration whatsoever. Methods of sewage disposal in Great Britain do not include any claim for the elimination of, say, typhoid infection or protecting sources of domestic water supply. Apart from the city of London no other large British city depends upon its water supply from sources open to or subject to sewage pollution. Sewage disposal, or sewage treatment, is not enacted in order that the rivers and streams may be less dangerous from a pathogenic point of view, but merely that their aesthetic value be maintained and fish protected by conserving the oxygen supply natural to the waters. Since the question of sewage disposal has been agitated in Canada it can be safely stated that medical men connected with public health questions have shown greater practical interest in the subject than all others put together. Generally, engineers have been apathetic and have shown little desire to trouble with a subject presenting many disputed and unknown factors. Politicians have fought shy of the question, and have not been sure of it as a vote-getting machine. Those responsible for municipal administration have not been enamoured with the idea of spending sums of money with no direct prospect of profit, and in simply doing something for the benefit of the other fellow further down the stream. Now it cannot be said that the medical health official has been actuated by his interests in fish life or to any great extent by the preservation of aesthetic values, but on the other hand he is directly interested in the reduction of mortality rates and the elimination of zymotic diseases. Dr. Chas. Hodgetts and others, over and over again, in referring to the necessity of legislation to prevent sewage pollution of inland waters have referred to the high typhoid mortality rate in Canada as compared with Great Britain and other countries.

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*Paper read before The Canadian Public Health Association, Regina, Sept., 19, 1913.

In approaching this question of sewage disposal, the point of view of the medical man appears to be generally accepted by the Canadian public. It appears reasonable to assume at the present time, that, if the public were told that efforts towards sewage disposal were not calculated to guard the purity of sources of domestic water supply, were not calculated to eliminate or decrease chances of disease infection, but were merely to provide against aesthetic nuisance, it would then be very difficult indeed to obtain the passing of a by-law in favor of any expenditure in this direction.

Yet, this medical point of view with reference to sewage disposal has met with no consideration in Great Britain, with only a little consideration in Germany, but with perhaps a fair amount of consideration in the United States.

In discussing any possible standards relative to purity of sewage effluents, we must first determine exactly why we are treating the sewage and what particular interests we are guarding in preventing raw sewage from entering any body of water.

Again, as an example of peculiar local conditions, we have our prolonged winters during which oxygination of inland waters practically ceases and fermentative and putrefactive processes become dormant. It does appear that in approaching this question of standards we must be careful to give full weight to general Canadian and local conditions as compared with those of other countries where certain basic and working principles have found particular favor.

Conclusions of Royal Commission

The conclusions of the Fifth Report of the Royal Commission on Sewage Disposal (Great Britain) par. 355 headed "Tests for Sewage Effluents in Relation to Standards," state in part, "According to our present knowledge, an effluent can best be judged by ascertaining, first, the amount of suspended solids which it contains, and, second, the rate at which the effluent, after the removal of the suspended solids, takes up oxygen from water."

"For the guidance of local authorities we may provisionally state that an effluent would generally be satisfactory if it complied with the following conditions:—

"(1) That it should not contain more than 3 parts per 100,000 of suspended matter; and

"(2) That, after being filtered through filter paper, it should not absorb more than:

"(a) 5 parts by weight per 100,000 of dissolved or atmospheric oxygen in twenty-four hours.

"(b) 1.0 part by weight per 100,000 of dissolved or atmospheric oxygen in forty-eight hours, or

"(c) 1.5 parts by weight per 100,000 of dissolved or atmospheric oxygen in five days."

Here we have a provisional general standard advised which takes cognizance only of the amount of suspended matter intercepted, and the stability of the organic content relative to its affinity for oxygen. The aesthetic nuisance is guarded against by the interception of solids and fish life is preserved by ensuring a chemically stable effluent.

Par. 304 of the above Report states:—

"We observe that previous commissions have reported that, of all the processes which were proposed for the purification of sewage, or of water polluted by excrementitious matter, there is not one which is sufficiently effective to warrant the use, for dietetic purposes, of water which has been so contaminated, and the 1868 commission stated that, in their opinion, 'rivers which had received sewage, even if that sewage had been purified before its discharge were not safe sources of potable water.' We, therefore, conclude that the framers of the Rivers Pollution Prevention Act, 1876, did not contemplate that local authorities should be required so to deal with their sewage that the rivers into which the purified sewage flowed might be regarded as safe sources of water supply, in cases in which the water was not to be filtered before distribution."

Par. 305 states,—"In our opinion much the same position must be taken up today. Although the methods available for the purification of sewage are more numerous than when the 1868 commission reported, our examination of a very large number of effluents from sewage farms, and from artificial filters of various kinds shows that although such effluents may be very good as judged by chemical and physical tests, they are generally liable to contain large numbers of micro-organisms of intestinal derivation, and that if such organisms are to be destroyed, or eliminated, the effluents must be subjected to some treatment additional to that which is ordinarily employed." Again, par. 309 states, "We are satisfied that rivers generally, those traversing agricultural as well as those draining manufacturing or urban areas, are necessarily exposed to other pollutions besides sewage, and it appears to us, therefore, that any authority taking water from such rivers for the purpose of water supply must be held to be aware of the risks to which the water is exposed, and that it should be regarded as part of the duty of that authority, systematically and thoroughly to purify the water before distributing it to their customers. Par. 310 goes on to state further, "Apart from the question of drinking waters we find no evidence to show that the mere presence of organisms of a noxious character in a river constitutes a danger to public health or destroys the amenities of the river. Generally speaking, therefore, we do not consider that in the present state of knowledge, we should be justified in recommending that it should be the duty of a local authority to treat its sewage so that it should be bacteriologically pure."

It must be perfectly clear and apparent that if British standards are to be accepted as applicable to Canadian conditions, that there is no necessity to demand any more efficient standard of purification than may be obtained by mere screening in discharging raw sewage into the great lakes. The ratio of fresh water to sewage is so great that dilution will prevent any nuisance either of a chemical or physical nature. Again, British standards if applied to our larger rivers will make sewage disposal a comparatively simple and easy matter to deal with.

Referring to Professor Dr. Dunbar of the Hamburg State Hygienic Institute (Principles of Sewage Treatment, page 239) "In the case of rivers which serve as sources of water supply, attempts should be made to restrict the infection to a minimum. In the case of rivers which are not used as sources of water supply, bathing places will have to receive consideration, as well as the river population, and the fact that the water of such rivers may come into contact with food destined for human consumption, as in washing of milk pails, the rinsing of vegetables, etc. In all cases where it is a question of discharging sewage into a river, the possibility of spreading infectious diseases must be considered. In certain circumstances it will be necessary to adopt measures for the separation or destruction of the infectious germs either permanently or temporarily." This view as expressed by Dunbar appears fairly to represent the medical health point of view in Canada. Is it the correct view? Are our conditions here in Canada of a nature that they demand an entirely different general standard of purification from that accepted in Great Britain? The author of this paper has always shared this view, which he takes the liberty of calling the "Canadian Public Health View."

George W. Fuller in a recent publication "Sewage Disposal," states, page 213, "Theoretically the treatment of sewage should not be made so complete that the sanitary benefit derived therefrom is incommensurate with the cost involved. Fortunately there is now available by the hypochlorite method a reliable means of disinfecting sewage or water at a small cost. The full significance of this is not yet fully appreciated. It has much bearing on the question of sewage disposal in general and on the dilution method in particular."

Disinfection of Sewage Effluents

Until recently, methods of disinfection of sewage effluents have been considered prohibitive with reference to cost, and it has been very generally agreed that it is cheaper and more effective to purify a water supply than attempt to remove the pathogenic impurities from sewage. After extensive experimental work, Prof. Phelps has been able to some extent to crystallize this subject and show that practically efficient disinfection of sewage effluents is economically possible. He has shown that practical disinfection may be obtained by the use of an average of eight parts per million of available chlorine with settled sewage, 13 parts with septic effluents and 3½ parts with sprinkling filter effluents. Chloride of lime in large orders costs about 1.5 cents per pound. The lime contains on an average about one-third of available chlorine. Thus one million gallons of settled sewage requires about 240 lbs. of chloride of lime, a septic effluent 390 lbs. and a sprinkling filter effluent about 105 lbs. Where average domestic sewage is treated fresh, septic conditions avoided, and the rate of filtration on sprinkling filters is about 2½ million gallons of sewage per day per acre of filter and six feet four inches in depth and the after humus is settled out, the author has data evidence that practical disinfection can be obtained by the use of 60 lbs. of chloride of lime per 1,000,000 gallons of sewage treated. The annual cost in the above case for lime would be $800 per annum.

It would appear then that other things being equal there is no economic objection to the Canadian Public Health point of view, that a standard of sewage effluent purification should insist upon disinfection where the effluent enters a domestic source of water supply or a water source which comes in contact with boatmen, bathers, and others.

This question in relation to standards, viz., the requirement of a chemically stable effluent or a disinfected effluent is likely to form one of the main points in any discussion between this country and the United States in relation to the pollution of boundary waters. It is, therefore, reasonable that our position be clearly defined in relation to our own local conditions.

There is an evident tendency in some quarters to accept the British point of view, and throw the whole responsibility of pure water supply upon those delivering the water and ask for only partial or physical treatment of sewage. The argument in favor of the British point of view appears to assume that a condition of water supply will eventually prevail by which every drop of suspicious water used for domestic supply will be efficiently purified. Such an ideal condition would certainly be welcomed, but is it possible to attain? The argument is also used that by disinfecting sewage effluents, you create a false impression of security, as there are uncontrollable sources of pollution apart from sewage discharge, and that municipalities relying upon the effect of disinfection of sewage may delay or refuse to purify water supplies. The author's opinion is, that in the light of modern economic methods of sewage disinfection, both methods of precaution should be taken wherever practicable. It is not a question of the one method of precaution as against the other. Large towns and cities can afford to install water purification plants. Small towns, villages, summer residences by lake or river shores, individual farmers, boatmen, bathers, etc., may not be in the position to take efficient measures to counteract the sewage infection of their only available source of water supply.

The use of the term uncontrollable infection or pollution is to some extent misleading and much that is looked upon as uncontrollable can by legislation be efficiently controlled. Refuse and sewage matters from ships may be here included. Storm water discharges from streets and inhabited areas may be collected in stand-by tanks and disinfected. What may remain as uncontrollable pollution is an extremely small factor as compared with the millions of gallons of sewage containing millions of intestinal bacteria which are constantly being discharged into our sources of water supply. The argument, that because 100 per cent. efficiency cannot be obtained, we should not attempt a ratio of efficiency, is an argument which if applied to other matters would cause all endeavor to cease.

Canadian Conditions Dissimilar from British

Conditions in Great Britain do not appear to demand the same standard of sewage treatment efficiency as they do in Canada. Great Britain owing to a comparatively equable climate, and a high rate of rain precipitation is able to collect and store its rain fall in districts which are free from chance of sewage pollution. That country is not dependent on its rivers and waterways for domestic water supply. On the other hand Canada has a comparatively low rate of rain precipitation demanding large catchment areas and storage of water subject in the summer months to hot and continued sunshine productive of algae and other vegetable growths, in the winter time to a thick ice covering cutting off the supply of atmospheric oxygen and retaining the gases and products due to vegetable decay. Canada has many fresh water ways, great lakes and rivers which form and must continue to form the main sources of domestic water supply. Can this country afford to allow the Great Lakes, the waterways and rivers to become so bacteriologically impure that it is absolutely necessary that every drop of water be treated and sterilized before being used for dietetic purposes? In Great Britain and in most parts of the United States the rivers have become so hopelessly impure that the destruction of the sewage bacteria would probably make very little difference one way or another. In Canada this hopeless condition of things has not yet occurred, and it appears that we have an opportunity now of checking any such possibility by adopting such standard with reference to sewage effluents which best fit our local conditions.

In this province we have two large rivers, the North and South Saskatchewans, other streams are small and to an extent present very little and at times no flow in the summer. The two large rivers will probably in the future form the chief source of available domestic water supply. The creeks and smaller streams will probably be dammed so as to conserve as much of the spring run-off as possible and will be used for both cattle and domestic water supply. Several cities and towns throughout the province have adopted systems of sewage treatment and in every case where the effluents discharge either into the large rivers or the smaller creeks, the system of sewage treatment has been directed so as to obtain a practically sterile effluent. In the case of the smaller creeks stable chemical effluents followed by disinfection have constituted the accepted standard, in the case of the two large rivers, well settled non-septic effluents followed by disinfection have been, generally, admitted as sufficient. In the latter connection, however, it is sometimes well to consider the comparative capitalized cost of filters as against the extra chlorine required for a merely settled effluent.

In connection with the city of Lethbridge the author had occasion to go into the question of the cost of filters as against the extra cost of chlorine for treating a merely settled effluent. Works were planned for 20,000 population produring a daily discharge of about 2,500,000 gallons per day. It was found that in order to obtain a fair percentage of disinfection 10 parts of available chlorine per million were required for fresh sewage liquid after 65 per cent. of the solids were removed by two hours precipitation. At 1½ cents per lb. the annual cost of the lime came to $4,000. After the settled sewage had been passed through a trickling filter of broken stone at the rate of 150 gallons per cubic yard of stone per day, and the resultant humus settled out, efficient disinfection was obtained by the use of 2 parts per million of chlorine, costing $800 per annum for lime. The difference in annual cost for lime represented at 5 per cent. a capital sum of $64,000. Filters were put in and completed at a cost of $30,000, producing a capital saving of $34,000 by adopting disinfection after filtration.

While the author does not think it expedient or even possible to lay down any defined standards with reference to degrees of purity of sewage effluents, and considers that each case must be considered on its merits, he is, however, convinced, with the evidence that he has at present before him, that the generally accepted standard of purity should include the removal of intestinal germs whenever the sewage has finally to pass into any water source which may by any chance be used for domestic purposes.

Haulage Outfit in Transporting a Big Electric Crane

This road freight car, built by the Buffalo Pitts Company, Buffalo, N.Y., is one of their standard 20-ton capacity cars used by many contractors in haulage work. The car is built with wooden frame, with steel facings and steel braces. The axles are 3½-inch solid steel, and the steel wheels are 48 inches high, having a 14-inch tire face. The car is equipped with patent reversible gear that makes every wheel track perfectly and enables steering a number of these cars in train either front or back with perfect ease. The tractor, also, is of Buffalo Pitts Company make.

Contractors are using haulage outfits for every conceivable kind of work outside their regular field of application. The Buffalo Pitts Company build many types of special cars on order and furnish their different types of standard cars in 5-ton, 10-ton and 20-ton capacity with patent reversible gears so that they may be coupled in one train.

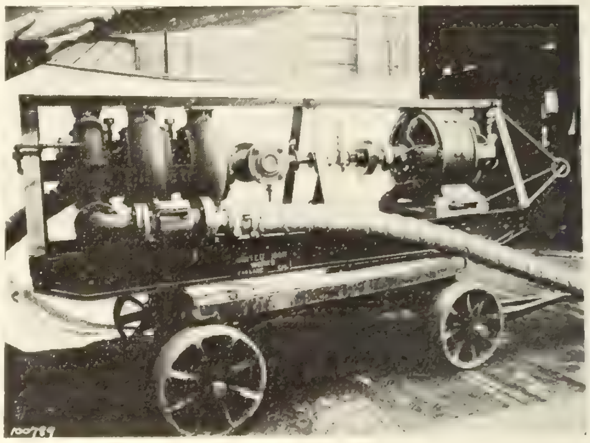
Standard 20-ton car.—Buffalo Pitts Company.

The new policy of improving the Intercolonial Railway includes the double-tracking of several sections of the road, increasing yard and shop facilities at several points, improved ferry service at the Strait of Canso, installation of a telephone despatching system on the St. John-Moncton section, where the automatic block system will also be introduced, and a general overhauling of station property, as well as the construction of several new and attractive station houses. Mr. F. P. Gutelius, the general manager, announces that a contract has been awarded to Messrs. Soper & McDougall for the double-tracking of eight miles of road from Levis to Chaudiere Junction, while the yards at Levis are also to be extended to about double their present size. Canadian firms have been invited to tender on a second ferry boat for service at Canso. The grade revision of the entire system, as promised when Mr. Gutelius took charge of the road, will be started on the Cape Breton section of the road as soon as authority for the expenditure has been obtained from Parliament.

Motor-Driven Pump for Operation on Inclines

The accompanying illustration shows an interesting application of a motor-driven pump. It is designed for mine drainage and is to be used on inclines up to forty-five degrees from the horizontal.

The pump and motor are held together in a steel frame work with an eye at the end to which a cable or rope is attached for lowering the outfit down the incline. The lower part of the framework acts as a skid.



Motor driven pump for mines.

Special arrangements had to be made for oiling the motor. The lubricating device for the lower bearing is seen between the coupling and the bearing housing; it is fed with oil from the upper end by means of a pipe.

The pump is 4-inch, three-stage, and operates at heads up to 250 feet. The motor has a capacity of 30 h.p. and is of Westinghouse manufacture.

To Prevent Car Shortage

The superintendent of car service on the Grand Trunk, Mr. J. E. Duval, has issued a circular asking co-operation to prevent car shortage this fall. In part the circular reads:

"Some consignees find it more convenient to use cars for storage rather than increase their warehouse or handling facilities, car service in their cases being the less expensive. Every such car held deprives some other trader of his car supply and increases the car shortage.

"One important and practical remedy for shortage of cars is very largely in the hands of the users of cars, for if they will provide larger warehouses, adequate facilities, and employ sufficient help so as to give the best possible despatch to the cars handled they will be made quickly available for further use by others who are anxiously waiting for them. In other words, first order only as many cars as can be promptly loaded each day; second, use every effort to load cars quickly and to their full capacity; third, provide adequate facilities and sufficient help to unload cars rapidly.

"It is to be hoped that shippers and consignees will not lose sight of the fact that the car supply question is one in the solving of which they can materially assist railways, and that no satisfactory solution can be effected without their co-operation."

The Constructional Field at the Coast

Building Returns Satisfactory—Optimistic Predictions Concerning Future Business—Good Progress on Larger Work—Many Important Contracts

Office of The Contract Record,
Vancouver, Sept. 17, 1913.

THE total number of building permits issued at Vancouver during August was 174, valued at $874,603. Compared with the corresponding period in 1912 these figures show a slight decrease, the permits taken out in August last year amounting in value to $944,970. For the first eight months of the present year permits to the number of 1,524 with a total valuation of $8,433,942 have been issued, while during the same period in 1912 the number was 2,357, valued at $11,151,702, the decrease during this year approximating $2,700,000. Despite this falling off, conditions in the building and constructional field at the coast continues fairly satisfactory, and contractors express optimistic opinions concerning the outlook for the balance of the year.

There is considerably less activity in the construction of dwellings in Vancouver and the adjoining municipalities this year, but in the business sections of the city the volume of building under way at the present time compares favorably with that in evidence during any previous season. It is to be hoped that an early start will be made on the proposed drydock and shipbuilding scheme at North Vancouver, and the government dock on the Vancouver side of Burrard Inlet. These projects will provide employment for a large number of both skilled and unskilled workmen all the year round, and it is felt locally that the inauguration of two such huge undertakings, fathered by the Dominion government, will have a stimulating effect on all branches of industry represented in Vancouver and the nearby coast points.

Important Contracts Described in Detail

Work on the first portion of the new Woodward Department Store, Vancouver, is being rapidly pushed ahead by the contractors, Messrs. Booker, Campbell & Whipple, and by Christmas it is expected that the premises will be ready for occupation. This part of the structure is located on the lane leading off Abbot street behind the present store, and the framework is now completed to the full height of six storeys. The foundations have been constructed strong enough to carry four additional storeys when required. The main store will have a frontage of 152 feet on Hastings street and 132 feet on Abbot, and will be ten storeys in height, The style of architecture is Neo-Grecian and the construction will be steel frame on a concrete foundation, the street elevations to be faced with Haddington Island stone. A granite base will be placed in the space below the show windows. One of the outstanding features of the architecture will be the large Corinthian columns on both street elevations, which extend to a height of 43 feet and are 4½ feet in diameter. A carved band of stone near the top of the building will give a further touch of decoration. Bronze entrance doors will be placed on the facades on Hastings street and Abbot street. Alaska marble will be used for the stairways, which are 20 feet in width. British Columbia fir has been chosen for the interior woodwork throughout. The floor space provided in the building will be 200,000 square feet. The arrangement of the interior will conform with the latest ideas in department store equipment and construction. It is planned to commence operations on the main structure as soon as the addition in the rear will have been completed, and it is thought that the entire contract will not be finished until early in 1915. The total cost of this huge building has been estimated at close on $1,000,000. Mr. W. H. Wenyon is the architect.

The Weart Building

During recent weeks steady progress has been in evidence on the new Weart Building, which is located at the corner of Richards and Hastings streets, Vancouver. The steel skeleton frame has been erected to a height of two storeys and all possible haste will be made by the contractors, the Canadian Ferro Concrete Company, to have this immense framework completed to the full height of fifteen storeys within the shortest possible time. The foundations have been carried to rock for a building measuring 78 x 120 feet, the three lower storeys to be terra cotta with a polished granite base, eight storeys above this are face brick, and the four remaining storeys are finished in marble and bronze. The main entrance corridor is designed in the same architectural style as the exterior; the walls and floors being of marble with bronze trimmings and ceiling of oak beams and panelling. The main floor is so planned that the corner can be occupied by a banking institution with the main entrance directly facing Hastings street. The main corridor is entered off a general vestibule, twenty-five feet wide, which leads to the basement stairs on one side and the bank entrance on the other.

New Woodward Departmental Store, Vancouver.

The typical floor contains thirty offices fitted with all modern equipment. Oak is employed as interior finish throughout. The corridor floors are of Terrazzo tile with marble borders. The fact that the building is fifteen storeys high and that the upper five storeys will never be blocked by other buildings adjoining, gave the architects a chance to treat the four sides of the building in a decorative manner, which presents a tower architecturally finished on all sides; the pinnacles above the fire walls are equipped with electrical illuminations. In designing the building the architects adopted the style known as Francis I. in which the general effect is based on Gothic traditions, but the details are Renaissance, a blending of classic and Gothic decorative forms. In this style the wide, overhanging cornice is omitted, and the upper portion of the structure recedes somewhat, instead of overhanging, the ornamentation being transferred in a considerable measure from horizontal to vertical lines. The decoration usually employed on a heavy cornice is, in this building, expended on its crowning tracery and pinnacles. An approximate expenditure of $700,000 has been estimated for this building by the architects, Messrs. Russel, Babcock & Rice, Vancouver. The contract for furnishing the complete equipment of tile for the Weart Building has been awarded to the Far West Clay Company, of Vancouver. The order will comprise in the neighborhood of 300,000 tile. The same company has also been given the contract to furnish the tile required in the new six-storey addition to the Woodward Department store building in Vancouver.

A Well-Planned Structure

Construction work has just been completed on this imposing apartment block which enjoys a beautiful situation on the corner of Beach avenue and Nicola streets, Vancouver, overlooking English Bay. The design of the building reveals many useful and artistic features which hitherto have not been embodied in local structures of this class. More especially does this apply to the planning of the interior which has been carried out with a view to providing as many of the advantages with as few of the disadvantages of houses and hotels as possible. The building itself measures 60 x 130 feet, and stands five storeys with full basement. It has a reinforced concrete exterior frame with interlocking hollow tile curtain walls, this method of construction being adopted to accommodate Meduca cement facing and the plastering of the interior, which is done directly on the hollow tile wall. The interior is of mill construction with solid 6-inch floors. The floors of all public hallways are covered wih terrazzo inlaid with marble, while the main stairway is of iron frame with terrazzo tile treads. The walls of the main entrance foyer are of cast and run Meduca cement. The building contains twenty-one suites, each comprising seven rooms and two bathrooms, in addition to suites reserved for the use of janitors. Each apartment has a large reception hall, equipped with an open fireplace, spacious living room with balcony, and dining room, the two latter rooms so arranged that they may be converted into one separate suite. The principal bedroom in each suite is so arranged that the bathroom adjoining may be used as a private one. The service quarters of each apartment, including maids' bedroom and bathroom, kitchen and pantry, are separated from the main portion. The interior finish adopted is worthy of special mention. The typical reception hall has, in addition to a mantel, a plate shelf and alcove, the effect being quite artistic. The dining room is planned on the Colonial style, painted white and panelled from floor to ceiling. All living rooms have beamed ceilings with mahogany doors and the interiors are finished entirely in white. Special attention has been given to the lighting fixtures, and these are of a class generally to be found in the better class of private homes. Semi-indirect lighting has been adopted for the dining-room, while bureau lights are provided in the bedrooms. The equipment of the bathrooms includes pedestal washbasins, and showers, all fixtures being of high grade workmanship. The remaining equipment of this building comprises an elevator, steam heating plant with oil burning apparatus in connection, garbage burners and store rooms for each apartment. Mr. Philip M. Julian, Vancouver, prepared the plans, the general contract being carried out by Messrs. Robertson & Hackett, the owners, who sublet the plumbing, heating, lighting, concrete work, etc. The building was erected at a cost of approximately $125,000.

Exterior and main entrance of new apartment building, corner of Beach Avenue and Nicola Street, Vancouver.

Another large ten-storey office block in Vancouver, due to be completed by July 1 next year, is the Credit Foncier Building, now in course of construction at the corner of Hastings and Hornby streets. This building is of reinforced concrete construction and the exterior will be finished with cut stone and terra cotta surmounted by a copper cornice. In the interior the floors will all be finished with rock maple. Marble wainscotting and terrazzo floors will be placed in the corridors. All the offices with the exception of those to be occupied by the Credit Foncier will be finished in oak. Mahogany will be used in finishing the quarters of the Credit Foncier. The Durham system of plumbing will be installed throughout the entire building. Three passenger elevators will be at the service of the tenants. One of these elevators will be geared to carry 5,000 pounds weight. The plans for this building were prepared by H. L. Stevens & Company, Vancouver, in co-operation with Messrs. Barrott, Blackader & Webster, architects, of Montreal. Construction work is being carried on by H. L. Stevens & Company.

Canadian Fairbanks Building Almost Finished

The new seven-storey warehouse building which is being erected for the Canadian Fairbanks Company, on Beatty street, Vancouver, is nearly completed. The Beatty street frontage of this structure is 268 feet, the C. P. R. track frontage 234 feet and the depth of the building 120 feet, making in all 20,300 square feet of land occupied by the warehouse. The building is of mill construction with exterior facing of pressed brick, trimmed with stone and will cost approximately $150,000. The first floor will contain the offices of the Fairbanks Company and the basement will be used for the heating plant, and also for additional storage space. The remaining floors will have space for the storage of hardware. Mr. W. H. Miller has charge of this contract, plans for which were prepared by Parr, McKenzie & Day.

Immense Powder Factory Proposed

The board of directors, a controlling interest of which is vested in Nobles Explosives, Limited, of Glasgow, Scotland, has appropriated $1,250,000 to erect buildings comprising the works of the new powder factory plant on James Island, near Victoria. The plans call for the erection of about 100 buildings, including cottages for the employees on the eastern part of the island. On the west side will be placed a wharf and other structures for the handling of material, supplies, etc., of a non-explosive nature. The contract has been awarded to Cullinton Bros., of Victoria, for the erection of the west side of the wharf. This is 800 feet long by 20 wide. It will be "T" shaped, and at one end will be placed a warehouse 50 x 400 feet in size. The company is now clearing the sites for the buildings and will immediately undertake the construction of a network of tram lines between the various points. The output of the new plant will be one hundred tons of explosives and black powder daily. Canadian Explosives, Limited, and the Victoria Chemical Company, Limited, of Victoria, represent the western control of the huge plant.

B. C. Telephone Company Expanding

An addition to industrial Vancouver is to be seen now at the corner of Yukon and Front streets, where the new plant and storage headquarters building of the B. C. Telephone Company stands completed. As will be seen from the accompanying view this structure has been erected on most substantial lines, the foundations being of solid concrete, and the upper portion composed of steel and red pressed brick with concrete floors. The building measures 80 x 120 feet and is four storeys with full basement. The basement will be used for the storage of heavy wire and telephone cable, while the portion under the loading platform will answer the purpose of a garage and repair shop and will have a graded runway to the street level. The first floor will consist of general stores and offices of the divisional superintendent of plant; second floor, construction stores and offices of superintendent of construction; third floor, switchboard construction and carpenters' shop, together with offices for same and space for building inspector; fourth floor, offices of general superintendent of plant and engineering department. This floor will also provide room for sundry stores. Railway trackage is provided at the side of the loading platforms. The general contract, valued at approximately $50,000, was carried out by Messrs. Smith & Buckland, New Westminster. Mr. J. Johnston, supervisor of the telephone company's buildings, prepared the plans.

Government Awards Contract for Vancouver Dock

The contract for the proposed government dock at Vancouver on Burrard Inlet, between Salisbury and Commercial Drives, has been awarded by the Dominion Government to the firm of Messrs. Henry, McFee & McDonald, at a figure of $1,250,000. The docks will be 800 feet long and 300 feet wide. A berthing slip 140 feet wide will be provided on each side, dredged out to a depth of 36 feet at the lowest stage of the tide. An appropriation sufficient for the first year's operations has been allocated, and the funds for the completion of the dock and the installation of all the latest contrivances in the way of electric travelling cranes, etc., will be appropriated later. It is expected that the docks will be finished within two years.

A great deal of preliminary work on the government wharf will be necessary. First of all the surface soil will have to be excavated. About 125,000 cubic yards of soil and rock will be removed and the bottom levelled. The solid rock excavation is expected to exceed 100,000 cubic yards, which will have to be drilled and blasted under water in depths varying from five feet to thirty-six feet below tide water. A great deal of this work will have to be done by divers. A foundation of crushed stone will be provided for the cribs, which will be filled with stone ballast, topped off with gravity sections forming a base for a retaining wall, which will extend around the outer edge of the docks.

The cribs will be covered with a layer of solid concrete. On the top of the foundation of crushed rock large sawn timbers will be placed, it being estimated that 1,000,000 feet board measurement, will be necessary for this purpose There will be twenty-three of the large cribs. They will be built in dry docks and sunk and filled solid. The contracting firm, the members of which are said to be Canadians, have established their offices in the Dominion Trust Building, Vancouver.

Floating Drydock and Shipbuilding Plant for Burrard Inlet

Approval has been given by Hon. Robert Rogers, Minister of Public Works, to the proposed drydock scheme and shipbuilding industry for the north shore of Burrard Inlet. The cost is now estimated at $4,000,000 for the two concerns which will be operated in conjunction. The plant will be located in D. L. 265, and will comprise a floating drydock, a shipbuilding works and repairing ways of the most modern and approved type. Officials of the Amalgamated Engineering Company, the firm which has the project in hand, state that work will be started as soon as the necessary arrangements are made with the government.

The original idea of the company was to invest $2,500,000 in the entire scheme, but it was afterwards decided to enlarge the scope of the enterprise. The basin will have a depth of 30 feet at low tide; the drydock will have a lifting capacity of 20,000 tons, and will be much larger than the one at first proposed. It will accommodate the largest vessel in the Pacific trade, according to the plans. Four building berths will be provided, two for 750-foot boats and two for 350-footers. Repair shops, equipped with all the latest electrical appliances, will be attached to the plant.

It is expected that it will take three years to complete the plant and docks. About 2,000 men will be given employment, it is estimated. The plans are now being rushed, and will be despatched to Ottawa so that an order in council may be passed.

The directorate of the company includes many prominent men in Canada and in Great Britain. The managing director will be Mr. C. J. V. Spratt, of Victoria. Identified with the project also are Col. Sir Henry Pellatt, Col. Sir John M. Gibson, Lieutenant-Governor of Ontario; Mr. D. B. Hanna, and Mr. E. J. Palmer, of the Victoria Lumber & Manufacturing Company, Chemainus. The advisory board is composed of prominent Old Country capitalists.

Victoria Architect Gets Important Commission

Mr. Loring P. Rixford, who first came into prominence at the coast as the architect of the Union Club Building in Victoria, was recently awarded the first prize in the competition for the adjudged best plans for the Provincial Royal Jubilee Hospital, to be erected on the site of the present structure in Victoria. Mr. Rixford's plans receive a premium of $1,500. Messrs. Somervel & Putnam of Vancouver were given second place with a prize of $1,000, and Messrs. James & Davidson, of Vancouver, came third, winning a premium of $500. In his report, Mr. J. D. Atchison, of Winnipeg, the advising architect in charge of the competition, commented on the exceptional merit displayed in the preparation of the fifty sets of drawings submitted, each of which showed that the author had made a careful study of this [illegible] problem, as well as the administration and de[illegible] of hospitals in general. It is understood that the winning plan is the most economical, exhibiting besides the fullest knowledge of the site and its possibilities. Mr. Rixford will now be appointed supervising architect. He has now been in practice since 1907 in San Francisco, and is a graduate of the Ecole des Beau Arts at Paris. He was city architect for some time in San Francisco, and among the important buildings he designed are the Bohemian Club and the San Francisco city and country general hospital. Mr. Rixford has maintained an office in Victoria since he commenced to practice in this province. It has been announced that tenders for this important contract are to be invited forthwith and the project which is expected to involve an expenditure of between $450,000 and $500,000 got under way as soon as possible. It is understood that in all cases local materials and local workmen are to be given the preference.

Coast Miscellanea

All of the exterior work on the new seven storey addition to the boot and shoe factory of J. Leckie & Company, Cambie street, Vancouver, has been completed, and work on the interior is being rushed ahead as quickly as possible. This building is of mill construction and will cost about $50,000. Messrs. Snider & Brethour have charge of the general contract.

It was announced at the coast recently that the Bank of British North America has purchased a site at the southwest corner of Menzies and Superior streets, Victoria, on which it is intended to erect a branch office building in the near future. The site comprises about 47 x 90 feet, and changed hands for a consideration of $15,000.

Plans were filed recently at the office of the Vancouver building inspector for the proposed immigration shed building, which will be erected in this city by the Dominion government at a cost of about $300,000 at the foot of Victoria Drive. In the basement will be a laundry, fumigation room and cook rooms. On the first floor will be a reception room, waiting, examination, inspectors' and guards' rooms. On the second floor will be men's dormitory for Chinese men and women, recreation room, discharging room, etc. The third floor quarters are intended for immigration officials. The building will measure 64 x 212 feet, and will be of reinforced steel beam construction, four storeys high.

Tenders are now being called for the construction of a first-class fireproof theatre building to be located on Keefer street, near Main street, Vancouver. The specifications provide for a structure of steel and brick, with pressed brick and terra cotta exterior. The dimensions will be 75 x 120 feet, and there will be seating capacity in the interior for approximately 1,700 persons. The stage will measure 32 x 73 feet with full equipment. There will be an exhaust system for both heating and ventilating, concealed or "indirect" lighting on an elaborate scale, ornamental plaster and considerable interior decorating, tile floors in the lobbeys and full modern equipment for an entirely up-to-date theatre building. The contract, for which tenders are desired only from responsible contractors, will cover everything excepting that equipment specially for "theatrical" building accessories. Mr. J. J. Donnellan, 319 Pender street, Vancouver, is the architect.

The contract for erecting the proposed three-storey building for the American Can Company on the C. P. R. reserve, Vancouver, was recently awarded to J. Carver & Sons. This factory building will be of brick and mill construction, and when complete will cost approximately $75,000. The company is backed by large capital and will engage extensively in the manufacture of cans.

In view of the fact that the city of Vancouver has recently disposed of a big block of its bond issues it is the intention of members of the council to have work undertaken without delay on both the proposed Creche and Old Peoples Home buildings. The contract for the Creche, a two-storey fireproof building to cost about $45,000 from plans by Mr. R. T. Williams, architect, is in the hands of Mr. Geo. E. Williamson, contractor, while the Old Peoples Home building is to be a brick structure, to cost about $40,000, from plans by Mr. R. T. Perry, architect, Messrs. Campbell & Wilkie, general contractors. Work on both buildings has been delayed since the contracts were let some weeks ago owing to the fact that the bonds remained unsold.

Tenders will shortly be called by the Burnaby School Board for the construction of an 8-roomed reinforced concrete school building to be erected on Vancouver Heights, an eminence overlooking Burrard Inlet. The cost of the structure has been estimated at approximately $75,000.

Mr. L. Taylor, architect, Vancouver, recently completed plans for the erection of a two and one-half storey and basement residence on Shaughnessy Heights for Dr. M. F. Keely, of this city. The plans provide for a structure measuring 40 x 42 feet, the construction to consist of stone to the first storey and above that, fir and stucco work. On the ground floor there will be a dining room, hall, kitchen, den, reception hall, living room and large porch; on the first floor there are provisions for four bedrooms, bath, balcony, etc., and the attic will contain a large billiard room, servants' quarters, smoking room, etc.

Plans are completed for a splendid residence for Mr. H. Bingham, a local capitalist, on Shaughnessy Heights, Vancouver. The exterior construction will be of hollow tile blocks, with stucco finish. The building will be equipped in a thoroughly modern manner throughout with hot water heat, considerable hardwood finish, etc. It is expected that figures on the general contract will be taken by the architect. Mr. G. B. Kaufman, during the first half of September. The cost of the building will be in the neighborhood of $13,000.

Efforts which have been made for some time past for the creation of a builders' exchange in Vancouver have at last proved successful, the preliminary organization of a builders' exchange for the city and district being now completed. Provisional officers have been appointed and a nominating committee has been named to prepare a list of nominations for officers to be voted on in the near future.

The Pacific Lime Company, of Vancouver, recently closed a contract with the Tacoma Smelting Company, of Tacoma, Wash., for 100,000 tons of limestone to be used for fluxing, delivery to start October 1. The company's plant at Blubber Bay is running at full capacity.

Mr. J. E. Hall, president of the Vancouver Grain Exchange, is authority for the statement that Vancouver people are interested in two proposed grain elevators to be erected on Burrard Inlet. There are no names or further details given out for publication.

Messrs. Perry & Fowler, architects, Vancouver, have been commissioned to prepare plans for the proposed Dominion drill hall, to be erected in Grandview, Vancouver. The building will be of fireproof construction, costing about $200,000. It will be some time before the tenders are wanted.

The contract for the Pitt River dredging recently awarded to the Pacific Dredging Company, Vancouver, calls for the dredging of a channel from the 25-foot contour in the Fraser bed, between Douglas Island and Coquitlam River, 800 feet in length and 300 ft. wide, 25 feet deep, ending in the pool to the north of Douglas Island. Nearly a million yards of material must be removed in dredging the channel. This material will probably be deposited on the lower end of Douglas Island and on the mainland above the mouth of the Pitt.

St. John and New Brunswick

Trade Active and Several Interesting Projects Announced — Shortage of Brick Hampers Operations

Correspondence of the Contract Record

The American Foundry Construction Company have instructed its representative to look over the situation at St. John as a possible site of a branch factory in Canada.

The Canada Cement Company have decided on a site for their new $1,000,000 plant near St. John, N.B. It is about ten miles from the city on the Intercolonial Railway. It is understood that the company will construct a model village there for their workmen.

The new observatory for the Meteorological service at St. John, N.B., the plans and specifications of which were prepared some time ago by Mr. Garnet W. Wilson, is now under construction. The building is to be of pressed brick, with olive sandstone trimmings and copper roofing, with a frontage of 120 feet and a depth of 300 feet.

The brick manufacturers at St. John have been utterly unable to cope with the demand for brick for building purposes this year. The Atlantic Refineries, Limited, have been compelled to order a million and a half brick from Nova Scotia. It is stated that considerably more brick buildings would have been erected in the city this summer but for the scarcity and high prices of material.

The St. John City Council has asked Hon. J. D. Hazen to arrange a conference with the officials of the Grand Trunk Pacific Railway to learn what the intentions of the company are with regard to the port of St. John. No action has yet been taken to provide terminals at St. John, although the company must eventually come to this port, and its line will be in a position to handle traffic within a year.

The St. John Railway Company will at once extend its line from the city along the Marsh Road for one mile, and then across to Kane's Corner at East St. John, returning thence to the city, and completing a circuit and providing a service which will be of the greatest benefit in building up that section of the outskirts of the city. The work will be completed within two months, as the company has all the material at hand and will have no difficulty in securing a large force of workmen.

The St. John and Quebec Railway Company's estimates for work on the St. John Valley Railway for the month of August, as submitted to the meeting of the Provincial Government at St. John recently, amounted to $220,000. It is not now expected that steel will be laid on the entire Fredericton-Woodstock section before next spring, the handicaps from the exceptionally unfavorable weather of the season of 1912 having been too great for it to be possible to catch up this month.

The Norton Griffiths Company have two very powerful dredges on the way out from England to be used in dredging Courtenay Bay at St. John, also two self-propelled hoppers from the Argentine to work with the dredges. Norton Griffiths & Company are considering the question of establishing a plant at St. John where machinery and parts of dredging fleets could be assembled and the work of construction completed, thus avoiding the risk there is in bringing such equipment across the Atlantic.

The Dominion Government has awarded a contract for the erection of grain conveyors at two additional steamship berths at West St. John. The work will cost about $140,000 and will be rushed to completion for use in the coming winter, when the new million-bushel elevator of the C. P. R. will also be in commission. The port of St. John will be in a much better position in the coming winter to handle grain shipments than ever before. By the winter of 1914-15 two more wharves with warehouses and other equipment will be completed, still further enlarging the capacity of the port.

Within the last two months two natural gas wells with a very high pressure have been struck in Albert County, N.B. In the well which is being drilled at Sussex, within forty-five miles of St. John, pockets of gas were struck several times in the first six hundred feet and a large body of gas is expected to be struck at a depth of fifteen hundred feet, which is about the depth of the Albert County wells. The piping of the gas from these wells into the city of Moncton has greatly reduced the cost of heat, light and power, and has proved of immense benefit for domestic as well as industrial purposes, and also in connection with the Intercolonial Railway shops.

Canadian Railroad Development

The announcement was recently made that work on the Dominion Western Railroad, which will run from a point on the international boundary line north of Great Falls, Mont., west into the Crow's Nest country, tapping the coal fields north to Calgary and on into the Peace River country, will be commenced at an early date. British and American capital is financing the undertaking.

According to Mr. J. D. McArthur, of Winnipeg, the contractor who is building the Hudson Bay line from Le Pas to Nelson, 420 miles, by the end of the fall at least 50 per cent. of the grading will be done, and about 125 miles of rails laid from the western end, as the entire road will have to be built from that end. The terminals and the railway are due for completion at about the same time, or say two years from now. Mr. McArthur is also carrying out the construction of the Edmonton, Dunvegan and British Columbia Railway. The contract calls for a line ending at Fort George on the Grand Trunk Pacific in British Columbia, but the present subsidies cover the section from Edmonton, the capital of Alberta, to Athabaska Landing and through the Peace River country, some 400 miles in all. In about five weeks time, Mr. McArthur says, they will have the road steeled to Athabaska Landing, 130 miles from Edmonton, and graded 125 miles beyond.

Double tracking on the main line of the C. P. R. between Mission Junction and Ruby Creek for a distance of nearly forty miles has now been completed. There are more than eighty miles of track parallel on the Cascade subdivision, which extends from Vancouver to North Bend, 29 miles from Vancouver. Regular train service over the newly-completed sections of double track will be started at an early date. The double-tracked portion of the line between Vancouver and Mission Junction has been in operation for some time. In connection with the improvement schemes, bridges have been rebuilt for two sets of metals on the district between Mission and Ruby Creek. With the exception of the bridge over the Harrison river, which is expected to be completed by February, all this work has been finished. The double track operations on the Cascade were started in May last year, and the work has entailed an expenditure of more than two million of dollars. Good progress is being made on the other sub-divisions, and the company is engaged in these operations for a distance of 24 miles west of Revelstoke and 25 miles east and nine miles west of Kamloops.

It has been announced that engineers of the Great Northern have already prepared plans for tapping the coal fields in southern Alberta. The Canadian Northern and the Edmonton, Dunvegan & British Columbia Railway companies are building lines into the northern district. The bonds on both lines are guaranteed by the provincial government of Alberta to the extent $30,000 a mile.

Mainly Constructional

The News in Brief—From Coast to Coast

A contract for a new drill hall at Winnipeg was recently awarded to the Carter-Halls-Aldinger Company of that city for $519,000.

A permit was recently issued to the Canadian Pacific Railway for the erection of a seven-storey office building at King and Simcoe streets, Toronto, to cost $250,000.

Four bank buildings are in course of construction at the present time in Prince Albert, Sask., the total expenditure being in the neighbourhood of $250,000.

Two additional freight sheds will be commenced this year by the Montreal Harbour Board. They will be two storeys high, with concrete piers, and steel superstructure.

Mr. Gosselin, of Levis, P.Q., has been awarded the contract for the construction of the workshops for the Transcontinental Railway at St. Malo. The cost will be $1,500,000.

La Compagnie des Habitation Salubres de Quebec, Limitee, was recently incorporated at Quebec with a capital of $100,000. One of the principal objects of the company is house building.

A remarkable increase is noticeable in the building permits at St. John, N.B., for the first eight months of 1913 as compared with the same period of 1912, the figures being $1,470,545 and $411,700 respectively.

It is expected that the government will award contracts shortly for the international storage elevators at Saskatoon and Moose Jaw. The time for receiving tenders has now expired and the elevators are to be completed by the end of 1914.

The contract for the Dominion Government share of the Toronto harbour improvement was let at a recent Cabinet Council, the successful tenderer being the Canadian Stewart Company, Limited. The contract price is $5,371,732.12, which is about 10½ per cent. under the original rough estimate of six millions.

Mr. T. Aird Murray, Toronto, is to be retained by the Whitby Town Council to advise them and submit plans for a sewerage system and disposal plant. At the present time the town is supplied with filtered Lake Ontario water, and the arrival of two new railway lines, the C. P. R. and the Toronto Eastern, points to great developments.

Three docks instead of one will be constructed by the Winnipeg and St. Boniface Harbour Commission next year. The commission has been promised a grant of $100,000 by the Dominion Government, but the money will not be available until the estimates have been approved at the next session of parliament. It is not expected that the $100,000 will complete the work and a further grant from the government is anticipated.

In connection with the Montreal underground conduit system now being completed on St. Catherine Street, Mr. Parent, civic superintendent of lighting, has prepared a report recommending the controllers to instal a system of arc lighting. It is proposed to erect 142 lamp standards 14 feet high and about 150 feet apart instead of the 350 feet which now separate the arc lights hung from wooden poles. It is also proposed to extend this system to other streets in the downtown district, but cluster lights will probably be employed in the residential sections of the city.

Building permits issued in Toronto in August, 1913, amounted to $3,175,450, as compared with $3,822,975 for 1912. The figures for the first eight months of 1913, however, are $20,832,771, as against $19,317,820 for 1912, an increase of 7 per cent. Corresponding figures in Montreal are:—$2,318,672 for August, 1913; $1,364,833 for August, 1912; $13,816,662 for the first eight months of 1913 and $11,179,376 for the corresponding period last year.

Work at Port Nelson, the terminus of the Hudson Bay Railway, is progressing rapidly and the Department of Railways and Canals has succeeded in placing there enormous stores of equipment and supplies necessary to carry out the plans. These call for a continuation of the work all the winter, so that when the Hudson Bay railway is completed facilities at the terminus will be adequate to care for the immediate traffic. Two hundred men are at work. They are engaged in building quarters, docks, storehouses and railway yards.

The members of the Ontario Highways Commission are at present on a trip of inspection. They will pay particular attention to the great state highways, where the New York road experts are endeavoring to work out a type of roadway best suited for heavy automobile traffic. The county roads of Ontario have been fairly satisfactory as to construction, but in the provincial scheme to be outlined through highways for heavy traffic will form an important part, and the commissioners are especially anxious to study New York State methods of handling that problem. The Quebec system of encouraging construction by giving rural municipalities the free use of road machinery in addition to financial assistance is also to be considered.

The Canadian Pacific Railway recently deposited plans for four additional storeys to the central portion of the Hotel Vancouver, Vancouver, and for the east wing fronting on Granville street, at an estimated cost of $1,100,000. The estimated outlay on the work of reconstructing the central portion of the hotel, calling for twelve storeys, was $800,000, so that with the addition of the work now proposed, the ultimate cost will not be far short of $2,000,000. According to the plans, the central part of the structure will be sixteen storeys in height, and the east wing will be eleven storeys, with the exception of the centre, midway between Georgia street and the Orpheum theatre. Here a large hall will be situated, for banquet purposes. The entrance to this hall will be 87 feet by 59 feet, and will be from Granville street. The whole structure will be of reinforced concrete and steel construction, faced with pressed brick.

Personal Mention

Mr. E. Drinkwater, town engineer of St. Lambert, P.Q., is preparing a report on a trunk sewer scheme for four municipalities on the South shore, opposite Montreal.

Prevost Hubbard, Assoc. Am. Soc. C. E., Lecturer in Highway Engineering Chemistry, Columbia University, and Mr. Arthur H. Blanchard, M. Can. Soc. C. E., Professor in Charge of the Graduate Course in Highway Engineering, Columbia University, have been appointed members of the United States Committee on "Standardization of Nomenclature of Road Materials." This committee is to co-operate with the Engineering Standards Committee of Great Britain.

Hon. W. H. Hearst, Minister of Lands, Forests and Mines for the province of Ontario, returned recently from an extended tour of northern Ontario, where he has been inspecting the road construction carried out during the past season under the supervision of Mr. J. F. Whitson, the government's northern development commissioner. Up to the present time 500 miles of roadway have been covered. $750,000 has been spent and before the end of the season the expenditure on highways in the north through Mr. Whitson's special work will amount to a million.

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies

Waterworks, Sewerage and Roadways

Blandford Twp., Ont.
Tenders received by Twp. Clerk, Geo. Oliver, Royal Hotel, Woodstock, until September 26th, for 270 ft. of 6-in., 600 ft. of 5-in. and 200 ft. of 3-in. tile drain.

Dundas, Ont.
Cement walks, Mountain, planned by Town Council. Clerk, J. S. Fry. General contractor, John W. Dickson.

Hamilton, Ont.
Asphalt, macadam and wood block pavements, cement curbs and walks, cost $50,033, planned by Council. City Clerk, S. H. Kent. City Engineer, A. F. Macallum.

Metcalfe Twp., Ont.
Tenders received by Twp. Clerk, Richard Ward, Strathroy, until October 3rd, for 600 rods of new open and tile drains.

Montreal, Que.
Concrete sidewalks, cost $21,000. Sec. of Board, L. N. Senecal. Engineer, Supt. Barlow, City Hall. Board of Control asked City Council to vote above amount for new sidewalks, likely to be built this fall.

Trunk sewer, St. Lambert and Longueuil, for South Shore Municipalities. Mayor, St. Mars of Longueuil, 4 St. Lawrence Blvd., Montreal. Engineer, E. Drinkwater, St. Lambert. Mr. Drinkwater is preparing report on large trunk sewer for South Shore.

Ottawa, Ont.
Pavements, cost $30,000. Mayor, J. A. Ellis. City Engineer, Archibald Currie. Tenders received until September 27th for asphalt pavements on Clarence St., King Edward to Chapel; O'Connor St., Queen to Laurier. Plans and specifications at office of engineer.

Winnipeg, Man.
Plank sidewalks on several streets contemplated by Rural Municipality of Kildonan. Sec.-Treas., H. Thompson, 215 Chambers of Commerce, Winnipeg.

Six wells will be installed for Rural Municipality of Kildonan. Sec.-Treas., H. Thompson, 215 Chambers of Commerce, Winnipeg, also sewer on Oakview ave.

Woodstock, Ont.
Cement walk and curb, Victoria St., contemplated by the City Council. City Clerk, John Morrison.

CONTRACTS AWARDED

Windsor, Ont.
Paving Pitt St. planned by City Council. Mayor, Henry Clay. City Engineer, Ed. Brian. General contractor, Thomas Chick. 8,000 sq. yds. asphalt block pavements at $2.79 per sq. yd.

Railroads, Bridges and Wharves

Dand, Man.
Location of Canadian Pacific Railway Company's proposed station, on Boissevain to Lauder Branch, has been approved.

Glacier, B.C.
Canadian Pacific Railway Company have been authorized to construct bridge near Glacier, on Mountain Sub-Div. No. 88.29.

Halifax, N.S.
Docks. Tenders received by Sec., L. K. Jones, Ottawa, Dom. Govt. Dept. of Railways and Canals, until Oct. 15th, for construction of about 6,500 lin. ft. quay wall, foundation for buildings, sewers, dredging of harbor to depth of 45 ft. at low water and filling reclaimed areas. First Unit, Contract No. 3. Plans, etc., at offices of General Manager, Moncton, Chief Engineer of above Dept., Ottawa, and at office of Supt. Engineer, Halifax, N.S.

Havelock, Ont.
Station contemplated for Canadian Pacific Railway. Plans will be prepared.

Kaslo, B.C.
Wharf and pile boat planned by Dom. Govt. Dept. of Public Works. Plans, specifications, at Dept. Tenders received by Sec., R. C. Desrochers, Ottawa, till Oct. 7, 1913.

Newcastle, Ont.
Pier. Tenders received by Sec., R. C. Desrochers, Ottawa, Dom. Govt. Dept. of Public Works, until Oct. 15th, for Eastern Pier. Plans, etc., at offices of J. G. Sing, Dist. Engineer, Confederation Life Bldg., Toronto, Postmasters, Kingston and Newcastle, and at Dept., Ottawa.

Peterboro, Ont.
Freight sheds, cost $15,625, Sharlotte St., for C. P. Rly., Peterboro office. Part of building to be erected this year. One storey, 50 x 410, frame construction. Plans drawn.

Quebec, Que.
G. T. Rly. Co. has been authorized to construct bridge in Parish of Dewittville, Co. Godmanchester, over Portage Creek, also bridge No. 113 over Coaticook River.

St. John, N.B.
Harbour terminals for Dom. Govt (Intercolonial Rly.). Manager, F. P. Gutelius, Moncton. Tenders will be called shortly.

Summerland, B.C.
Wharf planned by Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. Plans and specifications at offices of F. W. Aylmer, District Engineer, Chase, B.C., and Postmaster at Summerland and at Department, Ottawa. Tenders received by Secretary until Oct.

Taghum, B.C.
Bridges planned by Prov. Govt., Dept. of Public Works. Minister, Hon. Thos. Taylor. Engineer, J. E. Griffith. Plans, specifications, etc., at offices of the Govt. Agents at Nelson, New Westminster and Vancouver. Tenders received by Minister till Oct. 14th.

Bridge planned by Dom. Govt. Dept. of Public Works. Engineer, J. E. Griffiths, Victoria. Minister, Hon. Thos. Taylor. Plans, specifications, etc., at Dept., Victoria. Tenders received by Minister till Oct. 14th.

Vespra Twp., Ont.
Tenders received by Clerk until Sept. 27th for construction of reinforced concrete beam bridge over Willow Creek, Lot 13, Con. 4, Twp. of Vespra, at or near Midhurst. Clerk, A. B. Coutts, Barrie. Engineer, Frank Barber, 57 Adelaide St., E. Toronto.

Victoria, B.C.
G. T. P. Rly. has approved locations of stations at Mount Robson, Albreda and Eddy.

Canadian Pacific Railway Company have been authorized to construct bridge No. 24.20, over Crazy Creek, Shuswap Sub.-Div., B. C. Div., and bridge No. 19.00 near Mitigan, Shuswap Sub-Div., and bridge No. 97.2 over Virmillion River.

CONTRACTS AWARDED

Cheticamp, N.S.
Dredging planned by Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractors, Northern Dredging & Construction Co., Ltd., St. John, N.B.

Fort William, Ont.
Addition to car barns, cost $40,000, Walsh, planned by City Council. Architect, City Engineer. General contractor, P. J. Donahue, Room 1, Cameron Block, S. May St. One storey, 28 x 270. Foundations in.

Meductic, N.B.
Bridge planned by Dom. Govt. Dept. of Public Works. Chief Commsr., Hon. John Morrissy, Fredericton. General contractors, McBean & McLaggan. 250 ft. long.

Montmagny, Que.
Extension to wharf, cost $5,000, planned by Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractor, J. R. Boulanger.

Montreal, Que.
Ship building shed for Canadian Vickers, Ltd., 75 Notre Dame, Mais. General contractors, Arrols, Ltd., Glasgow, Scotland, or c/o Canadian Vickers, Montreal. Ship building tools mostly being supplied by British firms. 880 ft. long.

Concrete foundation and floor for shed, cost $14,433.75, Lachine Canal, planned by Dom. Govt. Dept. of Railways and Canals. Sec., L. K. Jones, Ottawa. Architect, Mr. Marceau, Supt. Engineer, Que. Canal, New Birks Bldg. General contractor, K. A. Morrison, Ottawa.

New Hamburg, Ont.
Bridge and retaining wall, cost $3,500, Hartmans Bridge, for County of Waterloo. Engineer in charge, Bowman & Connor, 36 Toronto St., Toronto. General contractors, Eichler & Huehn, New Hamburg. Bridge will be strengthened and new cement floor put in and retaining wall built, bridge 120 x 18.

North Bay, Ont.
Round house, cost $100,000, for C. P. Rly. Architects and general contractors, Sherwood & Sherwood. Roofing, Gordon O. Maitland. Skylights, Cochrane Hardware Co., $3,100. Two stys., 151 ft. x 108 ft. 10 in.

Ottawa, Ont.
Swing bridge, cost $10,380, Rideau Canal, planned by Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractors, John Donovan and W. A. McCarthy, Belleville.

St. Malo, Que.
Car shop repair plant, cost $1,500,000, for Commrs. of Transcontinental Railway. Sec., P. E. Ryan, Ottawa. General contractor, Jos. Gosselin, Levis, Que.

St. Paul, Man.
Footings in bridge, cost $5,500. Sec.-Treas., W. Gorham, Birds Hill. General contractors, Fowler & Young, 221 McDermott Ave., Winnipeg. Reinforced steel supplied by Manitoba Bridge & Iron Works, Logan Ave. W., Winnipeg.

Toronto, Ont.
Harbor improvements, cost $5,371-372.17, for Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. General contractors, Canadian Stewart Co., Ltd., E. T. Bank Bldg., Montreal.

Public Buildings, Churches, Schools, etc.

Castor, Alta.
Post office, cost $10,000, planned by Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa Site has been selected.

Charlottetown, P.E.I.
Alterations to picture theatre, Queen St., for Nicholas Carr, Queen St. Capacity 600, seating and theatre fittings required. Plans prepared.

Durham, Ont.
Post office and customs house, Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Architects, Forster & Clark, Owen Sound. Plans in progress.

Twp. Emily, Ont.
School house for School Sec. No. 8. Tenders received by Wilbert Fee, R. M. D. No. 1 Omemee, Ont., until Sept. 27th Brick construction, stone foundation.

Fort William, Ont.
Customs examining warehouse, May St. N., extended time. Tenders received by Sec., R. C. Desrochers, Ottawa, Dom. Govt. Dept. of Public Works, until Oct. 14th. Plans, specifications, etc., at offices of H. E. Matthews, Supt. Architect of Dom. Public Bldgs., Prov. of Manitoba, Winnipeg, Man., W. P. Merrick, Dist. Engineer, Ft. William, City Clerk, Ft. William, and at Dept., Ottawa.

Guelph, Ont.
Repairs and improvements to school, cost $3,000, Central School. Chairman, J. M. Duff. Architects, Colwill, Tanner & Co. Plans drawn.

Lethbridge, Alta.
School, cost $2,700, planned. Architects, H. M. and W. A. Whiddington. One storey, 25 x 50, concrete construction. Tenders in.

Montreal, Que.
Public bath, cost $35,500, Rielle St., for Board of Commissioners. Sec., L. N. Senecal. Architect, Thos. Daoust, 26 St. James St. Tenders received from L. Langevin, 228 Parc Lafontaine, $35,500; Savage & Lecocq, 213 St. Ferdinand, $42,000; C. E. Deakin, Sommer Bldg., $46,357; H. Lesperance, 90 Pine E., $46,200; Quinlan & Robertson, Galt Ave., $47,995. Two storeys, 50 x 100, concrete foundation, reinforced concrete and stone construction.

Fire and police station, cost $85,000, Bois de Boulonge, for Board of Commrs. Sec., L. N. Senecal. Architect, C. A. Reeves, 58 St. James St. Only one tender received which was too high. Will probably be called again. Two storeys, 80 x 120, concrete foundation, reinforced concrete construction.

Incinerator contemplated by Town Council of Lachine. Sec.-Treas., Mr. Hector Charette. By-law submitted September 18th.

Nazareth Institute for the Blind, 95 St. Catherine W. Econome, Sister Belanger. Intend to build as soon as real estate deal is put through at present under way, when new site will be sought. Plans will be prepared.

Moncton, N.B.
Nurses' Home planned by the Hospital Board. Architect, C. B. Chappell, Charlottetown, P.E.I.

Ottawa, Ont.
Lavatory, cost $15,000, City Hall Sq. Mayor, J. A. Ellis. Architect, C. Sullivan, Castle Bldg., Queen St. Tile facing inside and reinforced concrete construction, concrete foundation. Tenders received by Mayor until Sept. 30th.

Port Alberni, B.C.
The Alberni Land Company has donated a site on which it is proposed to erect a high school with the aid of the Provincial Government.

Port Arthur, Ont.
Customs examining warehouse, Arthur and Water Sts. Tenders received by Sec., R. C. Desrochers, Ottawa, Dom. Govt. Dept., of Public Works, until Oct. 14th. Plans, etc., at offices of F. Y. Harcourt, Dist. Engineer, Port Arthur; H. E. Matthews, Supt. Architect of Dom. Pub. Bldgs., Prov. of Manitoba, Winnipeg, Man.; Thos. A. Hastings, Clerk of Works, Postal Station F, Yonge and Charles Sts., Toronto; City Clerk and at Dept., Ottawa.

Regina, Sask.
Nurses home, cost $25,000, for City Council (Hospital Board). City Commissioners, L. A. Thornton. Plans being prepared.

Toronto, Ont.
Post office alterations, cost $4,000, Yonge St., planned by Dom. Govt., Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Architects, James, Loudon & Hertzberg, 79 Adelaide E. Two storeys, 40 x 40, steel and brick construction, brick foundation. Tenders received by Architects.

Tenders received by Sec.-Treas., W. C. Wilkinson, City Hall, until noon Sept. 26th, for plumbing, heating and electric wiring in Balmy Beach School, Pape Ave. School, and McMurrick St. School.

School, Regal Road, planned by Board of Education. Tenders received by Sec.-Treas., W. C. Wilkinson, City Hall, untill noon Sept. 26th (either bulk or seperate).

Enlargement of school, Kimberley Ave., planned by Board of Education. Tenders received by Sec.-Treas., W. C. Wilkinson, City Hall, until Sept. 26th.

Fruit market, near foot of Church St., contemplated by Board of Control. Mayor, H. C. Hocken. Architect, Engineer E. L. Cousins, City Hall. Plans to be prepared immediately.

Girls' home, Jarvis St., contemplated by Fred Victor Mission, 145 Jarvis St. Site purchased, 235 x 55, 40 rooms.

Truro, N.S.
Post office planned by Dom. Govt. Dept. of Public Works. Sec., R. C. Desrochers, Ottawa. Three storeys, 40 x 40. New building is contemplated, using old for customs house.

Offices and hall, cost $25,000, Prince, contemplated for Independent Order of Oddfellows. Building will not be commenced this year.

Victoria, B.C.
School, cost $50,000, planned. Secretary, W. T. C. Pope, 1127 Catherine St. Architects, Spurgin & Wilkins, 465 Times Bldg., awarded first place in recent competition for plans.

Wingham, Ont.
Addition to Wingham General Hospital. Secretary, R. Vanstone, Drawer 28, Wingham. Architects, Stevens & Lee, 2 College St., Toronto. Tenders will be received by secretary until Oct. 1st. Plans and specifications at Hospital.

Winnipeg, Man.
School Deer Lodge (Linfield St.), for Rural Municipality of Assiniboia. Sec., F. Ness, Kirkfield P.O. Architect, A. Melville, 405 Builders Exchange, Winnipeg. By-law was submitted to ratepayers on September 13th and passed. Work will start at once.

Church for St. Martins, Seven Oaks. Pastor, Canon Gill, 3 St. Cross St. Architect, E. D. Tuttle, 701 McArthur Bldg. Frame construction, stone foundation. Tenders will be called in a few days.

West London, Ont.
School, cost $25,000, planned by Board of Education. Chairman, E. R. Dennis. Architect not selected yet. Two storeys, white brick construction.

Windsor, Ont.
Public school, cost $40,000, Wyanodtte, for Board of Education. Sec., Alex. Black. Plans under way.

Addition to church, cost $7,000, Windsor St., for All Saints Congregation. Chairman, Capt. W. J. Willoughby. Architects, Leybourne & Whitney. Two storeys, 48 x 27, 22 x 26, structural steel and brick construction, brick foundation, shingle roofing, electric lighting, steam heating, maple floors, sheet metal, seating. Tenders received by Architects until Oct. 2nd.

CONTRACTS AWARDED

Twp. of Barton, Ont.
Two schools for School Section No. 3. Architects, Brown & Fryer, 207 Clyde Block, Hamilton. Masonry, H. C. Gummo, 15 Tuckett street, Hamilton. Carpentry, Murray & Connor, 230 Locke St., Hamilton. Steel and roofing, Thos. Irwin & Sons, 22 McNab St., Hamilton. Plastering, R. J. Passmore, Chedoke. Painting, Briggs & Hutchinson, 50 Aikman Ave., Hamilton. Heating, Adam Clark & Co., 7 Main St. W., Hamilton. Electric, Culley & Breay, King St., Hamilton.

Brockville, Ont.
Arena, cost $11,970, Gilmore street, for Brockville Arena Co. Architect, A. S. Allaster. General contractors, Bislow & Horton. 20 x 110, frame and mill construction, concrete foundation.

East Flamboro, Ont.
School, cost $25,000, planned for School Section No. 2. Sec.-treas., Jos. Smiley, Aldershot, P.Q. Architect, J. A. Armes and W. Scott, Federal Life Bldg., Hamilton. Carpentry, P. H. Coleman, Burlington. Steel, Hamilton Bridge Works, Hamilton. Roofing, plumbing and heating not let. Plastering, Fred Klainka, Burlington. Painting, A. McKay, Waterdown. Electrical, Culley & Breay, King St., Hamilton.

Halifax, N.S.
Laboratory building, cost $6,620, planned by Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractors, D. M. Thomson and A. C. Theakston, Halifax. Building for the Halifax Quarantine Station.

Hamilton, Ont.
Club house, cost $10,000, for East Hamilton Progressive Ass'n. President and architect, Wm. Kinch. Builder, Jas. Bryers, King and Gibson ave. It is planned to erect club house in three days, work to start in about a month.

Hall, cost $5,000, Emerald street. General contractor and owner, William Kerr, 806 Bank of Hamilton Bldg. Brick construction.

Alterations to school, Hess street, for Board of Education. Secretary, R. H. Foster. General contractor, W. H. Yeates, 24 Leeming street. Electric wiring and telephone system, Electric Supply Co., James St. S.

Lindsay, Ont.
Armoury planned by Dom. Govt., Department of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractor, James Bogue. Carpentry, A. McIntyre, Peterboro. Plumbing, Geo. McFadden. Roofing, heating and tinsmithing, W. R. Turner, Peterboro.

Twp. Louth, Ont.
School, cost $8,000, planned by Trustees School Section No. 7. Architect, A. E. Nicholson, St. Catharines. Masonry, J. Nichols & Sons, St. Catharines. Carpentry, Williams & Messler, St. Catharines. Painting and glazing, Leach & Jones, St. Catharines. Plumbing and heating, S. P. Gourlay, St. Catharines. One storey and basement, stone foundation, pressed brick construction. Georgia pine finish.

Montreal, Que.
College building, University, for Wesleyan Theological College, c/o Professor Richardson, Montreal West. Architects, Ross & MacDonald, 1 Belmont, Montreal. General contractor, C. E. Deakin, Sommer Bldg. Carpentry, Wm. Rutherford & Son, 425 Atwater. General contractor receives private tenders for trades. Five storeys.

High school, cost $500,000, Westmount, for Protestant Board of School Commissioners, Westmount Academy. Architect, D. H. MacFarlane, New Birks Bldg. General contractor, C. E. Deakin, Sommer Bldg. Steel sashes and doors, Walker Hardware Co., 252 St. James street. Two storeys, 200 x 150.

Church, cost $225,000, Westmount (Roslyn and Lansdowne), for Dominion Methodist Church. Pastor, Dr. Rose, 64 Windsor. Architects, Badgley & Nicklas, c/o Mr. Barr, 23 Guy Block, St. Catherine W., Montreal. Stone and masonry, W. A. McNeill, St. Mary's, Ont. Other contracts not let. Excavating will start shortly.

Moncton, N.B.
Church, cost $62,000, Church and Queen, for First Baptist Church. Architect, C. B. Chappell, Charlottetown, P.E.I. General contractor, J. M. Clark, 54 Church street, Moncton. Mason, O. J. Dunham, 50 Brydges, Moncton. Excavating done.

Ottawa, Ont.
Customs Bldg., cost $995,000, Essex St., planned by Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractors, Simcoe Construction Co., 16 King St. W., Toronto, and Midland, Ont. Subcontractors, Crockett & Tharle, 14 Murray Block, Fort William. Mr. Tharle, Chateau Laurier, Ottawa (present address).

Stratford, Ont.
Theatre, cost $10,000, Ontario street, for William Gordon, Albion Hotel. Architect, J. S. Russell, 21 Downie street. Heating, F. L. Duggan. Electric, M. J. Higgins.

Toronto, Ont.
Experimental station, cost $10,000, Cherry, for Sir D. Mann, 74 King St. E. General contractors, Imperial Construction Co., 74 King St. E. Two storeys, 4 x 46, reinforced concrete and brick construction.

Enlargement of school, Shirley street, planned by Board of Education. Secretary-treas., W. C. Wilkinson, City Hall. Masonry, John McMurren, 319 Roxborough St. E., $18,283. Carpenter, J. A. Berridge, 518 Manning ave., $12,000.

Wadena, Sask.
School, cost $26,700. Architects, Rielly, Dawson, Hancock & Reilly, 512 Westman Chambers, Regina. General contractors, Collum Bros., Humboldt. Six rooms, brick construction.

Welland, Ont.
Court House, repairs, planned. County Clerk, Robert Cooper. General contractor, A. Clark, 90 Farnham ave., Toronto. Work to start shortly.

Winnipeg, Man.
Drill hall, cost $519,929. Dom. Govt., Dept. of Public Works. Secretary, R. C. Desrochers, Ottawa. General contractors, Carter-Halls-Aldinger Co., 1919 Union Bank Bldg.

Alterations to theatre, cost $10,000, Fort street, for C. W. Vanderlip, Victoria Theatre. Architect, H. G. Holman, 11 Jordan Bldg., Fort street. General contractors, Lailey & Co., 367 Maryland St.

Business Buildings and Industrial Plants

Brantford, Ont.
Shop and residence, cost $4,000, Colborne street, for Geo. McDonald. Plans in progress.

Dundas, Ont.
Bank building for Royal Bank of Canada, Head office Montreal. Interior furnishings and fittings required. Plans are being prepared.

Edmonds, B.C.
Hotel, cost $75,000, planned for B. G. Walker. Will be built on property on Edmonds Road and Kingsway facing B. C. E. R. tracks.

Kingston, Ont.
Extension to stables for Dom. Govt., Dept. of Militia & Defence. Deputy-Minister, Eugene Fiset, Ottawa. Tenders received by Director of Contracts, Dept. of Militia & Defence, until noon, Sept. 30, for extension to stables, Tete-de-Pont Barracks. Plans, specifications, etc., at offices of Officer Commanding 3rd Div., Kingston, and Director General of Engineer Services, Headquarters, Ottawa.

London, Ont.
Factory, cost $15,000, contemplated for Jas. Cowan & Co., 91 York street. Architect to be selected. Two storeys, white brick construction.

Medicine Hat, Alta.
Addition to store, cost $6,500, Main St., for Hewitt & Black, Main street. Architects, Bourne & Morrison, Huckvale Block. Two storeys, 25 x 40, brick construction and foundation. Plans ready.

Montreal, Que.
Factory contemplated for L. E. Moulton & Co., 955 St. James St. Site not purchased. May build this fall but probably in spring. Incorporated with capital of $50,000.

Factory for Specialties Limited, c/o Mr. D. MacAvoy, 4 St. Lawrence Blvd. Company incorporated with capital of $200,000. Plans under way.

Auto garage for Montreal Autobus Co. U. H. Dandurand, vice-president, 50 St. James St. Architects, Ross & MacDonald, 1 Belmont street. To be built next summer. Plans to be drawn this winter.

Factory and office contemplated for Durbin Drain Pipe Connector Co., Ltd., Montreal. Solicitors, Parker & Clark, Traders Bank Bldg., Toronto. Capital, $300,000.

Addition and alterations to Bank, St. James and McGill, for Bank of Toronto, head office, Toronto. Stone and steel construction. Plans in progress.

Light manufacturing building, cost $45,000, for Robt. Neville, 11 Bushby Lane. Architects, Wright & Son, 204 St. James St. Preliminary prices only received. Specifications will be prepared and tenders called in about ten days. 4

storeys, 40 x 86, concrete foundation, reinforced concrete construction.

Ottawa, Ont.

Alterations to stores and apartments, cost $4,000, Slater street, for C. B. Taggart, 341 McLeod. Architect, W. Herbert George, Castle Bldg., Queen street. Plans in progress.

Factory, cost $6,000, Catherine street, for Wm. F. Frazer, 279 Arlington ave. 50 x 60, concrete and stucco construction, concrete foundation. Plans in progress.

Lumber mill, cost $100,000, contemplated by J. R. Booth, Bridge street; decided to erect fireproof structure on site of mill destroyed by fire. This building will probably not be commenced until spring. Reinforced concrete construction, concrete foundation.

Prince Albert, Sask.

Bank, cost $30,000, for Bank of Nova Scotia, 117 River W. Manager, Chas. McMillan. Plans ready.

Regina, Sask.

Implement warehouse, cost $45,000, contemplated for Tudhope Anderson Co., 8th and Broad. Have acquired site from City Council. Six storeys, 55 x 115. Plans will be prepared.

Warehouse for Campbell Bros. & Wilson, Princess and Bannatyne Streets, Winnipeg. Architect, J. H. G. Russell, 1110-1111 McArthur Bldg., Winnipeg. 5-storeys, brick construction and foundation. Plans in progress.

Sarnia, Ont.

Alterations to head office, cost $10,000, contemplated for Northern Navigation Co. Manager, S. Patton. Architect to be selected. Head office of company to be moved from Collingwood. Office fittings required.

Stratford, Ont.

Addition to factory contemplated for Avon Hosiery Limited, 82 Erie St. Local manager, W. Pearson. Plans will be prepared.

Factory addition contemplated for Canadian General Electric Co., King & Simcoe Sts., Toronto, Ont. General manager, J. Frederick Nicholls, c/o company.

St. Boniface, Man.

Rendering plant, cost $10,000, Dawson Rd., planned for A. C. Turner, Glenwood. Architect, H. G. Holman, Jordon Bldg., Fort St., Winnipeg. Two storeys, 30 x 30, brick construction, concrete foundation. Contract will not be awarded for some time, owner making arrangements for finances.

Strathroy, Ont.

Ice house, cost $3,000, for R. M. Pincombe. Cement construction and foundation. Plans drawn.

Toronto, Ont.

Store, cost $4,000, cor. Davenport and Weston Rd., for R. Leighton, 2113 Davenport Rd. Architect, G. Mason, 2106 Davenport Rd. Owner will call tenders about October 6th. Two storeys, 22 x 48, brick construction, stone foundation,

Four attached stores and residences, cost $8,000, Queen St. E., for M. T. Allen, Queen & McLean. Two storeys, 70 x 52, brick and steel construction. Plans prepared.

Store, cost $2,500, Bloor and Havelock, planned for N. Kaplan, 1015 Bloor W. Architect, H. S. Kaplan, 82 King St. E. Plans and specifications with owner, who will receive tenders. Two storeys, 40 x 25, brick construction, felt and gravel roofing.

Eleven stores, theatre and garage, cost $50,000, Yonge St., planned. Architect, L. Foulds, 21 Leader Lane. Tenders will be called at once. 260 x 50, brick and stone construction, shingle, felt and gravel roofing. Galvanized iron skylights, ventilators.

Store and residence, cost $8,000, Royce ave., planned for M. Yetman, 997 Dufferin St. Architect, W. G. Hunt, 935 Bloor St. W. Three storeys, stone and brick construction, stone foundation, shingle, felt and gravel roofing. Plans and specifications with owner who will receive tenders.

Weyburn, Sask.

Departmental store, cost $20,000, for McKinnons Ltd. Contemplate adding two extra storeys, making five in all.

Windsor, Ont.

Factory contemplated for Renchard-Elmes Shirt & Tie Co. Sec.-treas, B. L. Elmes. Plans will be prepared.

Wyoming, Ont.

Box, basket and woodenware factory, cost $5,000, for Daniel Senecal. One storey, white brick construction. Plans in progress.

CONTRACTS AWARDED

Berlin, Ont.

Factory for Canadian Buffalo Forge Co., 17 Bleury St., Montreal. General contractor, Morris & Allen, H. O., Buffalo, U.S.A. Further information from Mr. MacAvity, 17 Bleury St., Montreal.

Brantford, Ont.

Store and residence, cost $3,900, for Geo. McDonald, 417 Colborne St. General contractor, Jesse Usher, 122 Northumberland. Two storeys, 25 x 65, concrete foundation, sand lime and brick construction. Store fronts and fixtures. Excavating done.

Barn and feed house, cost $13,000, Bow Park Farm, for Dom. Canners Ltd., Hamilton. Manager, O. Herold, Bow Park Farm. Architect, A. A. Gilmour, Preston. Masonry, A. J. Cromar, 448 Colborne St., Brantford. Barn one storey, 60 x 150, feed house three storeys, 30 x 60, corrugated iron construction, concrete foundation, corrugated iron and metal shingle roofing.

Fort William, Ont.

Warehouse, cost $47,000, Hardisty, for Fife Hardware Co., Hardisty St. Architect, R. E. Mason. General contractors, A. C. Stewart & Co. Four storeys, 60 x 115.

Nail plant, cost $110,000, Montreal St., for Steel Company of Canada, 1272 Notre Dame W., Montreal. Architects and general contractors, Prack & Perrine, 38 James St. S., Hamilton. 36 ft. high, 600 x 150.

Business Block, cost $20,000, Simpson St., for T. W. Bowlker, Boston, Mass., c/o G. A. Duncan, Fort William. Architect and general contractor, Henry Russell. Two storeys, 50 x 80, frame and brick veneer front construction, concrete foundation, asbestos roofing. Excavating done.

Hamilton, Ont.

Store, apartments and mill, cost $12,000, for Dunlop-Magee Co., 125 John St. S. Mason, R. Isbister, 125 Wellington St. S.

Store, cost $4,000, King St. E., for B. E. Webster, 661 King E. Architect, F. W. Warren, 808 Bank of Hamilton Bldg. General contractor, Stanley Kerr, 408 Garth street. One storey, brick construction, concrete foundation. Permit granted.

London, Ont.

Addition to factory, cost $40,000, for McCormick Mfg. Co. Manager, Geo. McCormick. Architects, Watt & Blackwell, Bank of Toronto Bldg. General contractors, Canadian Frost & Winchester Co., Ltd., 5 Curry Hall, Windsor. One storey, 100 x 300, reinforced concrete construction.

Medicine Hat, Alta.

Warehouse, cost $15,000, 3rd ave., for Hewitt & Black, Main St. General contractor, Lussier Construction Co. One storey, 50 x 102, structural steel and brick construction.

Garage, cost $7,500, Fewings, for C. Coulter, 621 Fewings St. General contractor, J. Stannard, 418 Fewings Street. One storey, 50 x 120, brick construction.

McAdam Jct., N.B.

Bank building for Bank of Nova Scotia. Manager, Frank Estabrooks. General contractor, Henry Post, Woodstock, N.B. Two storeys, concrete foundation, frame construction, felt and gravel rfg.

Montreal, Que.

Factory addition, cost $17,000, Conde St. Owner and general contractors, Cote Bros. & Burritt, 51 Conde St. Two stys., 49 x 50, concrete foundation.

Bank and offices, cost $14,000, Verdun (Ethel), for Bank of B. N. A., 30 St. James St., Montreal. Architect and general contractor, C. J. Brown, 4263 St. Catherine W. General contractor will call tenders for roofing, heating, plumbing and electric later. Two storeys, 35 x 40, brick construction, concrete foundation. Excavating started.

Store, cost $30,000, Viger, for J. B. Drapeau, 915 St. Hubert. General contractor and carpenter, D. Dupras, 430 Champlain. Private tenders to be received by general contractor.

Store and flats, cost $4,500, Masson, for A. Gaboury, 315 Stuart ave., Outremont. General contractor, F. A. Grothe, 6 Cuthbert St. Three storeys, 22 x 60, concrete foundation, pressed brick construction. Excavating done.

Repairs to offices and warehouse, cost $10,000, for H. Joseph & Co., 16 St. Sacrament. General contractor, Robt. Neville, 11 Busby Lane.

Store, cost $11,000, Masson, J. A. Gauthier, 3593 St. Hubert, general contractor and owner. Two storeys, 35 x 70, concrete foundation, brick construction.

Store, St. Catherine W., for Guarantee Pure Milk Co., 875 St. Catherine West. Architects, Wood & Miller, 50 Royal Insurance Bldg. General contractors, Reid, McGregor & Reid, Guy Block. Painting, Alex. Craig, 41 Jurors. Heating and plumbing, J. A. Gordon, 301 St. Antoine.

Stables, cost $10,000, for Toilet Laundry, 425 Richmond St. Architects, Hutchison, Wood & Miller, 50 Royal Insurance Bldg. General contractor, A. F. Byers, 340 University. 20 x 60.

Warehouse, shops and office, cost $40,-

000, Beaumont, for Gen. Fire Extinguisher Co., 175 McCord St. Architect, Robt. Findlay, 10 Phillips Place. General contractors, Reid, McGregor & Reid, Guy Block. Tenders received by general contractors for roofing. Painting, Alex Craig, 41 Jurors. One and two storeys, 220 x 120, concrete foundation, brick construction.

Stores, etc., cost $750,000, St. Catherine and St. Denis, for U. H. Dandurand, cor. St. James and St. Lawrence. Architects, Ross & MacDonald, 1 Belmont. General contractor, C. E. Deakin, Sommer Bldg. Private tenders are received for all trades. Heating and plumbing, T. Lessard & Sons, 191 Craig E. Ten storeys.

Store and flats, cost $4,500. Architect and general contractors, O. Desrochers, 1756 Papineau and Des Carrieres. Three storeys, 50 x 50, brick and Montreal cut stone construction. Foundations in.

Ottawa, Ont.

Addition to stores, cost $300,000, Rideau & Sussex streets, for A. E. Rae Co. Architects, Ross & MacDonald, Montreal, 1 Belmont St., General contractors, Doran & Delvin, Sussex St., Ottawa. Foundations started on new wing, roof stripped for two additional storeys, inside operations commenced.

Store alterations, cost $3,000, for J. A. H. Brouse, Bank St. Architect, W. Herbert George, Castle Bldg., Queen St. General contractors, Esdale & Douglas, 318 Lisgar St. Solid brick construction, concrete and brick foundation.

Business block, cost $190,000, Queen St., for Ottawa Journal Co. Manager, P. D. Ross. General contractors, Shuttleworth & Black, Queen St. Seven stys. Walls up.

Stores and offices, cost $50,000, Rideau, for Blackburn Bros., Creighton St. Architect, W. E. Noffke, Central Chambers, Elgin St. Ornamental Iron, Beaver Brass & Iron Works, Ottawa and Toronto. Painting, heating and plumbing, not let yet.

Factory, cost $10,000, Catherine St. Architect and general contractor, Mc Auliffe-Davis Co., Duke St. Heating, Sheldon Co., Galt, Ont. Felt and gravel roofing.

Alterations to bank building, cost $15,000, Wellington street, for Bank of Montreal. Manager, Mr. Parker. Architect, C. P. Meredith, 126 Sparks St. Mason, T. C. James, 140 Flora. Carpenter, J. G. Adamson, 126 Sparks St. Plastering, Jas. McLaughlin, 649 Gilmour. Painting, Geo. Higman & Sons, 176 Rideau. Heating and plumbing, McKinley & Northwood, Rideau. Electric, Marchand & Donnelly, Sparks St. Ohio sandstone construction, stone foundation.

Red Deer, Alta.

Business block, cost $5,000, Gaetz ave., for C. Hamilton, Builder, Hugh Clark. Mason, J. McIntosh. Heating and plumbing, Day Hardware Co. Electric, Western General Electric Co. Two stys., 22 x 44, brick construction, cement foundation. Fittings for butcher store required.

Toronto, Ont.

Ship building plant, 265 Wellington W. General contractor and owner, E. Rainage Ship Building Co., 265 Wellington W. One storey, 45 x 121, steel and brick construction.

Offices, cost $10,000, 1642 Dundas St., for R. C. McCormack, 336 Annette St. Architects, Ellis & Connery, 72 Queen W. Masonry, Reid & Shortz, West Toronto. Carpentry, H. Chappel, 239 Evelyn. Roofing, A. Matthews, Ltd., 256 Adelaide W. Plastering, Cannon Nelson, 425 Clinton St. Painting, Fell Bros., 44 McMurray. Plumbing, R. Paterson, 907 Keele. Electric, Moon & Dunn, 1724 Dundas St. Three storeys, 18 x 42, brick and stone construction, concrete foundation.

Warehouse, cost $60,000, 439 Wellington W., for Victoria Paper & Twine Co., 415 King W. Architect, S. L. Yolles, 67 Baldwin St. General contractors, H. Weinerman, A. Osherenko & A. Sax, 29 D'Arcy St. Five storeys, 50 x 120, brick construction and foundation.

Store and residence, cost $3,000, Eglinton ave. Owner and builder, W. H. Sharpe, 16 Ferndale ave. Work will be done by day labor. Two storeys, 20 x 38, brick construction and foundation.

Stores and offices, cost $950,000, King and Yonge Sts., for Guardian Realty Co., 501 C. P. R. Bldg. Architects, Ross & MacDonald, 1315 Traders Bank Bldg. General contractors, Geo. A. Fuller Co., Ltd., Stair Bldg. Tenders received by general contractor for ornamental iron, sheet metal and roofing.

Addition to packing house, cost $25,000, for Puddy Bros., 45 Paton Road. Architects, Chadwick & Beckett, 18 Toronto street. General contractors, Wm. Vokes, 228 Rusholme Rd. Two storeys, reinforced concrete and brick construction, concrete foundation.

Thorold, Ont.

Alterations to bank building, Main St., for Royal Bank of Canada. Architect, A. E. Nicholson, St. Catharines. Carpenter, J. N. Joyce, Thorold. Two storeys, stone foundation, brick construction.

Victoria, B.C.

Hotel for C. M. Cookson, 711 Pandora, Architect, L. W. Hargreaves, 504 Sayward Bldg. General contractors, B. C. Granitoid & Construction Co., Exchange Bldg., Vancouver. Four storeys, reinforced concrete construction.

Vancouver, B.C.

Addition to hotel, cost $1,000,000, for Hotel Vancouver. Architects, Painter & Swales, 553 Granville. General contractors, Skene & Christie, 782 Howe. 11 storeys, 228 x 85.

Windsor, Ont.

Store, cost $8,000, Pitt St., for Osterhout & Little. Architects, Leybourne & Whitney. Two storeys, 85 x 26. Foundations in. Work being done by day labor.

Residences

Calgary, Alta.

Residence, cost $6,000, 13th St., for J. G. Poretous, 610 24th ave. west. Two storeys, 24 x 34. Plans ready. Permit granted.

Lacombe, Alta.

Residence, cost $6,000, Barnett Ave., for A. M. Campbell. Plans prepared.

Montreal, Que.

Residence, cost $18,000, Outremont (Blvd. St. Joseph and Querbes), for Wilfrid Duquette, 2668 Park ave. Owner will purchase supplies and build residence.

Six flats, cost $6,000, Iberville, for W. C. Ball, 204 St. James. Architect, J. O. Harris, 180 St. James. Three storeys, 25 x 40, concrete foundation, brick construction. Plans ready.

Ottawa, Ont.

Residence, cost $6,000, for Walter J. Martin, 392 Nelson street. Brick veneer construction, stone foundation. Plans will be prepared.

Residence, cost $4,700, Fourth Ave., for G. A. Clark, 106 Kent St. 2½ storeys. 24 x 33, brick veneer construction, stone foundation. Plans in progress.

Residence, cost $4,000, 3rd ave., for Stanley Ferguson, 119 McLaren. Two storeys, 19 x 36, brick veneer construction, stone foundation. Plans in progress.

Regina, Sask.

Residence, cost $30,000, planned for J. P. McColl, 203 Rose St. Architects, Storey & Van Egmond, Credit Foncier Bldg. 2½ storeys, brick construction and foundation. Tenders called.

Toronto, Ont.

Residence, cost $3,500, Orchard View, for Wallace Smith, 117 Delaware ave. Architect, Thos. Hancock, 836 Dovercourt Rd. Two storeys, 18 x 38, brick construction and foundation. Plans drawn.

Two pair residences, cost $10,000, St. Clair Gardens, for W. Pennock, 5 Burlington Cres. Tenders received by owner for brick and stone work. Carpentry being done by day labor. Two storeys, 32 x 46, brick construction and foundation.

Victoria, B.C.

Apartment, cost $45,000, Cook and Collinson streets, planned. Architect, C. E. Watkins, Green Block. Tenders will be called soon. Three storeys, brick construction, frame interior, 34 suites of 2 and 3 rooms.

Bungalow, cost $12,000, Qualicum. Architects, Spurgin & Wilkins, 465 Times Bldg., are preparing plans.

Apartment, cost $70,000, planned. Architect, H. Bryant Newbold, Jones Bldg., Fort St., expects to call for tenders about October 1st.

Vancouver, B.C.

Apartment, cost $17,000, Broadway E. Architects, Stuart & White, Metropolitan Bldg. Two storeys and basement, 66 x 66, frame and stucco construction. 12 suites, disappearing beds, hot water heating.

Winnipeg, Man.

Residence, cost $4,800, Balfour, for J. H. LaPlante, 271 Evanson St. Two stys., 24 x 34, frame construction, stone foundation. Plans ready.

Residence, cost $5,000, Wolseley, for J. Beaton & Sons, 417 Maryland. Two storeys, 28 x 30, frame construction, stone foundation. Plans ready.

Residence, cost $3,000, Polson avenue, for C. G. Perry, Suite 14, Fairbairn Blk. Two storeys, 20 x 24, frame construction, stone foundation. Plans ready.

CONTRACTS AWARDED

Brucefield, Ont.

Residence, cost $3,500. Architect and general contractor, Robt. Watson, Brucefield, P.O. Red pressed brick construction, stone and concrete foundation. Excavating done.

Fort William, Ont.

Apartment block, cost $25,000, Brodie

(Continued on page 75)

Tenders and For Sale Department

Sealed tenders, addressed to the undersigned, and endorsed "Tender for Repairs to Eastern Pier at Newcastle, Ont.," will be received at this office until 4 p.m., on **Wednesday, October 15, 1913**, for the Repairs to Eastern Pier at Newcastle, Durham County, Ontario.

Plans, specification and form of contract can be seen and forms of tender obtained at this Department and at the offices of J. G. Sing, Esq., District Engineer, Confederation Life Building, Toronto, Ont., and on application to the Postmasters at Kingston, Ont., and Newcastle, Ont.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, September 16, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department. 46374. 39-40

Department of Militia and Defence

Extension to Stables, Tete-de-Pont Barracks, Kingston, Ont.

Notice to Contractors

Sealed tenders, marked on the envelope "Tender for Construction of extension to stables, Tete-de-Pont Barracks, Kingston," and addressed to the Director of Contracts, Department of Militia and Defence, Ottawa, will be received until noon, **September 30th instant**, for the construction of an extension to the stables at Tete-de-Pont Barracks, Kingston, Ont.

Specifications may be seen and full particulars obtained at the offices of the Officer Commanding the 3rd Division, Kingston, Ont., and the Director General of Engineer Services, Headquarters, Ottawa.

Tenders must be made on the form supplied by the Department of Militia and Defence, and accompanied by an accepted cheque on a Canadian Chartered Bank, for ten per cent. (10 p.c.) of the amount of the tender, payable to the order of the Honourable the Minister of Militia and Defence, which amount will be forfeited if the party tendering declines to enter into or fails to complete the contract in accordance with his tender.

The Department does not bind itself to accept the lowest or any tender.

EUGENE FISET,
Deputy Minister.

Ottawa, September 2, 1913.

Newspapers will not be paid if this advertisement is inserted without authority from the Department 47356. 38-39
H. Q. No. 44-7-73.

Stratford's Water Commissioners Invite Separate Bids for the Supply of

(a) A 150 h.p. steel boiler to carry a 120 lbs. working pressure. The offer to be accompanied by full specifications and drawings showing the type, sizes, fittings, foundation and setting.

(b) Also, for a similar boiler capable of 150 lbs. working pressure.

(c) Also, for one high duty reciprocating steam pump, to deliver 1¼ million imperial gallons of water per 24 hours at 80 lbs. pressure. Preference will be given to a pump that could do this duty economically, and yhe when required for fighting fire, could get 120 lbs. water pressure. This offer to be accompanied by full specifications and drawings that show the foundation.

The Commissioners will be at the cost of putting in all foundations and steam pipes, but not of steam shut-off valves for each. All metal work must be put together by the contractor, and delivered here f.o.b.

Time for delivery—from acceptance of bid—six weeks.

Bids to be in on or before the 4th of October, 1913.

The lowest or any bid not necessarily accepte.

W. H. TRETHEWEY,
39-40 Sec.-Treas. Water Commissioners.

Sealed tenders addressed to the undersigned, and endorsed "Tender for Wharf Extension and Warehouse at Barcebridge, Ont.," will be received at this office until 4 p.m. on **Tuesday,** October 21, 1913, for the construction of a Wharf Extension and Warehouse at Bracebridge, District of Muskoka, Ontario.

Plans, specification and form of contract can be seen and forms of tender obtained at this Department and at the offices of J. H. Armstrong, Esq., District Engineer, Midland, Ont.; J. G. Sing, Esq., District Engineer, Confederation Life Building, Toronto, Ont., and on application to the Postmaster at Bracebridge, Ont.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupation, and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. Desrochers, secretary.

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, September 22, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—47003. 39-40

Sealed tenders addressed to the undersigned and endorsed "Tender for Examining Warehouse, Fort William, Ontario," will be received at this office until 4 p.m., on **Tuesday, October 14, 1913**, for the construction of the building mentioned.

Plans, specification and form of contract can be seen and forms of tender obtained at the offices of Mr. H. E. Matthews, Superintending Architect of the Dominion Public Buildings, in the Province of Manitoba, Winnipeg, Man.; W. P. Merrick, Esq., District Engineer, Fort William, Ont.; at the office of the City Clerk, Fort William, Ont.; and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, September 11, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—47782. 39-40

Sealed tenders addressed to the undersigned, and endorsed "Tender for Examining Warehouse, Port Arthur, Ont.," will be received at this office until 4 p.m., on **Tuesday, October 14, 1913**, for the construction of the building mentioned.

Plans, specification and form of contract can be seen and forms of tender obtained at the office of the City Clerk, Port Arthur, Ont.; F. Y. Harcourt, Esq., District Engineer, Port Arthur, Ont.; H. E. Matthews, Esq., Superintending Architect of the Dominion Public Buildings, Winnipeg, Man.; Mr. Thos. A. Hastings, Clerk of Works, Postal Station "F," Cor. Yonge and Charles streets, Toronto, Ont., and at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures, stating their occupations and places of residence. In the case of firms the actual signature, the nature of the occupation, and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. (10 p.c.) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,

R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, September 11, 1913.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.—47781. 39-40

TENDERS

To Contractors

Bulk or separate tenders will be received by the undersigned up to

Wednesday, the first day of October,

at 5 o'clock p.m., for the several trades required in the erection of a Warehouse Building on the southeast corner of Adelaide and Charlotte Sts.

Plans and specifications may be seen and all other information obtained at the offices of the architect.

The lowest or any tender not necessarily accepted.

GEO. W. GOUINLOCK, Architect.
Suite 1108 Temple Building,
39 Toronto, Ont.

Notice to Contractors

Asphalt Pavements

Sealed tenders addressed to the Chairman and Members of the Board of Control, City Hall, Ottawa, will be received by the Secretary of the Board of Control, up to 4 p.m., **Thursday afternoon, October 2nd, 1913**, for the construction of asphalt pavements on:—

Clarence St. from King Edward Ave. to Chapel Street.

O'Connor St. from Queen St. to Laurier Ave.

Any tender received after the above stated time will be declared informal.

Specifications and full particulars may be obtained on application at the City Engineer's office, City Hall, Ottawa.

The Corporation does not bind itself to accept the lowest or any tender.

ARCH. CURRIE,
City Engineer.
Ottawa, Sept. 23rd, 1913. 39

To Contractors

Sealed tenders marked "Tender for Plumbing, Etc.," addressed to the undersigned, will be received at this Department until noon of **Monday, October 6th, for** heating, plumbing and electric wiring of the Dormitory for the Boys at the Institution for the Deaf and Dumb, Belleville, and the Institution for the Blind, Brantford.

Plans and specifications can be seen at this Department and at the above Institutions.

An accepted bank cheque payable to the Honourable J. O. Reaume, Minister of Public Works, for five per cent. of the amount of the tender and the bona fide signatures and addresses of two sureties or the name of a guarantee company approved by this Department, willing to provide bonds for the due fulfillment of the contract, must accompany each tender.

The Department is not bound to accept the lowest or any tender.

By order,

H. F. McNAUGHTEN,
Secretary, Public Works Department.
Department of Public Works, Ontario.
Toronto, September 22nd, 1913.

Newspapers publishing this advertisement without authority will not be paid for it. 39

Special Notice

Every man who puts in a tender must see your plans and specifications first. If you are in Montreal and he is in Vancouver the inspection of your plans is a problem. Let us solve that for you. Place on file copies of your plans and specifications in any or all of the "Contract Record" offices.

Contractors and manufacturers read the "Contract Record." It is the logical place to look for tenders called, and where most important works are advertised.

Send along your plans when asking for tenders put a line in your advertisement to that effect.

No extra charge is made for filing plans at one or all four offices.

Contract Record and Engineering Review

Montreal—119 Board of Trade.
Toronto—220 King Street West.
Winnipeg—Commercial Travellers' Bldg.
Vancouver—429 Pender Street.

Residences

(Continued from page 73)

St. N., for C. G. Jenkins, 711 Victoria Ave. Architect, R. E. Mason. General contractor, C. E. Ward. Heating, Higginbottom & Co., 117 Leith St. Plumbing, Wm. Brayley, Frederick St. N. 3-storeys, 50 x 55.

Hamilton, Ont.

Residence, cost $25,000, for J. W. Lamoreaux, 26 Canada St. General contractor, W. H. Yeates, Jr., 24 Leeming St. Plastering, J. Clapham & Son, 69 Hughson St. N.

Montreal, Que.

Six pair semi-detached residences, cost $35,000, Outremont, Architect and general contractor, Geo. W. Goodbody, 549 Durocher. Two storeys and basement, 40 x 50 each pair, concrete, pressed brick construction.

Twelve flats, cost $15,000, Richelieu. Owner and general contractor, D. F. Deslauriers, 343 Richelieu. Three storeys, 63 x 54, concrete foundation, brick construction.

Residence, cost $4,500, Church. Owner and general contractor, Patrick Farmer, 1128 Galt ave. Two storeys, 30 x 30, concrete foundation, brick construction.

Flats, cost $10,000, Verdun (1st Ave.). Owner and general contractor, Ulric St. Amand & Pilon, 1337 Wellington. Three storeys, 46 x 66, concrete foundation, brick construction.

Ottawa, Ont.

Residence, cost $7,000, Rosedale, for W. H. Collins, c/o General contractor. Geo. Eaman & Son, Isabella St. Brick veneer construction, stone foundation.

Residence, cost $7,000, Carling, for A. E. McCormick, 77 McLaren. Architect, W. Herbert George, Castle Bldg., Queen St. Carpentry, Saunders Bros. Plastering, Bowman & Son. Painting, A. J. Marshall, 5 O'Connor. Heating and plumbing, M. M. O'Connell, Gloucester. Electrical, J. A. Ellacott, Bank Street.

Toronto, Ont.

Two family residences, cost $5,000, Woodbine. General contractor and owner, J. Ellenson, 211 McCaul St. Architects, Ellis & Connery, Manning Chambers. Two storeys, 28 x 36, brick construction.

Power Plants, Electricity and Telephones

Montreal, Que.

The city contemplates the purchase of electric lighting standards for police and fire departments. Sec. Board of Commissioners, L. N. Senecal. Engineer, Mr. Parent, Supt. Lighting Dept., City Hall.

Telephone Exchange, cost $100,000, St. Urbain, for Bell Telephone Co., Notre Dame and St. John. Architect, W. J. Carmichael, Bell Telephone Bldg. General contractors, Jno. Stewart & Co., Bethune St. Concrete foundation, Ohio sandstone and steel construction, concrete floors, electric lighting, hot water heating, tile floors, plate glass, two passenger elevators, copper cornices, architectural iron stairs. Excavating done.

Street lighting, St. Catherine and Bleury, planned. Secretary, L. N. Senecal. Engineer, Mr. Parent, Light Supt., c/o City Hall, Montreal. Plans to be submitted to Board of Control for 225 single standard lamps. Tenders will be called shortly.

Regina, Sask.

Power house planned by City Council. Supt. of Light and Power Dept., E. W. Bull. Architects, Storey & Van Egmond. Steel work, Western Steel Supply Co., Ltd., 1941 Scarth, $33,434. Piping and valves, Crave & Ordway, Toronto, $18,000. Boiler feed line, Canadian Fairbanks-Morse Co., Ltd., 300 Princess St., Winnipeg, $3,084. 174 x 130, concrete foundation, brick and stone construction.

Saanich, B.C.

Lighting system planned by Municipality of Saanich (Works Committee), 2 constant current regulators, with a capacity of 500 lmps, of 80 watts or 450 lamps of 94.4 watts and 250 locations.

Victoria, B.C.

Council have adopted recommendation of Electric Light Committee for the purchase of additional machinery for the telegraph street lighting station, including a spare transformer. Secretary, W. J. Dowler.

Geo. M. Miller & Co.

Architects

Toronto General Trust Building TORONTO

Power & Son,

Architects and Building Surveyors

Merchants Bank Chambers,

Kingston, Canada

MacLean Daily Reports Limited

The only systematic method yet devised for reporting BUILDING AND ENGINEERING projects from their inception to completion. Ask us for Rates and Specimen Reports.

220 King Street West - TORONTO

TRADE MARK

Reg. U.S. Pat. Off.

BAY STATE

Prevent your concrete or cement from hair cracking with

Bay State
Brick and Cement Coating

It excludes dampness and will protect building material from rust and disintegration.
Gives an artistic dull effect which does not take away the distinctive texture of concrete.
Can be used in mills, garages, private houses, hotels, railroad stations and office buildings.
Ask your dealer for it. If he cannot supply you write us for Booklet M. that tells you all about Bay State Brick and Cement Coating.

Wadsworth, Howland & Co., Inc.
Paint and Varnish Makers and Lead Corroders
82-84 Washington Street - Boston, Mass.
New York Office, 101 Park Avenue at 40th Street
CANADIAN REPRESENTATIVES:
Gouinlock & Crawford, 217 Confed. Life Bldg., Toronto, Canada
David McGill, 83 Bleury St., Montreal, Canada

Messrs. Waitt & Bond, Boston, Mass.
Densmore & Le Clear, Engineers.

The ATHEY Cloth-lined Metal Weather Strip

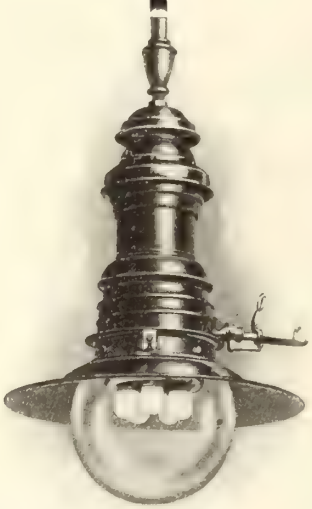
THE only one that keeps out all draughts and dirt.

THE only one with a cloth-lined channel in the sash.

Installed by

The EBERHARD & WOOD Mfg. Co.
Ornamental and General Iron Works
36-38 Lombard St. Phone Main 6338 TORONTO

N.B. Can be installed on Steel Casements of any type.



A Brilliantly Lighted Store Gets the Trade

BECAUSE IT GETS ATTENTION

–it is conspicuous—being a blaze of light, it can never be overlooked, forgotten or passed by—it **burns itself into the consciousness of the people.** Artistic and effective lighting **IMPRESSES** the people **FAVORABLY,** because it carries with it an inference of prosperity and progressiveness it gives tone and character to an establishment. A well-lighted store commands trade, because **it commands confidence.** Trade instinctively shuns the dark just as knavery and sharp practice shun the light. Half lights and shadows make people suspicious, but brilliant and adequate illumination disarms suspicion. In the light all things appear in their true colors, and what the people can see clearly they buy readily and with confidence. **People patronize the store where they can buy with comfort and assurance. Humphrey Outdoor Gas Arc Lamps make your store "stand out" in the nighttime.** They draw trade. The **HUMPHREY INDOOR GAS ARC LAMPS** show goods in their right colors. They prove the saying that "goods well displayed are half sold." Send for our representative, who will explain our system. Gas lamps pay profits.

The Consumers' Gas Co.
12-14 Adelaide St. West Telephone Main 1993

Dietrich LIMITED

Underground Conduit Systems

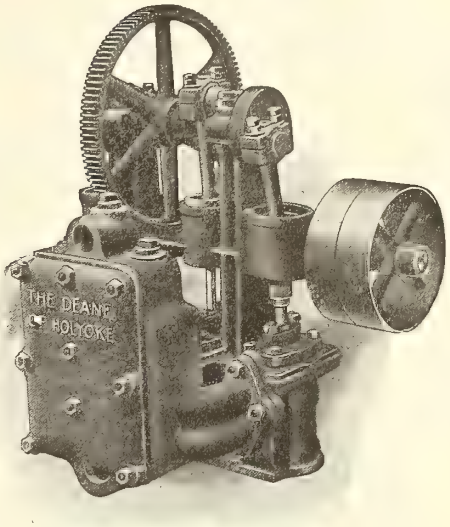
Dietrich LIMITED

Designed **correctly** and installed **properly** no matter what natural difficulties present themselves.

REPEAT ORDERS INDICATE THE SATISFACTION OF OUR CLIENTS

300 Read Bldg., Dietrich LIMITED MONTREAL

Phone Main 7134



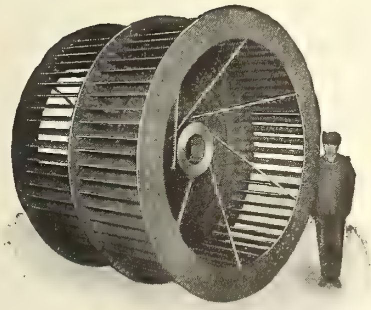
DEANE POWER PUMPS

ADMIRABLY ADAPTED FOR

HOUSE SUPPLY
BOILER FEEDING
TANK SERVICE

THE JOHN McDOUGALL
CALEDONIAN IRON WORKS CO., LIMITED

Works: Seigneurs & William Sts., MONTREAL.
Manufacturers of Boilers, Castings, Condensers, Elevators, Engines, Filters, Forgings, Hydraulic Machinery, Pumps, centrifugal and reciprocating, Steam Turbines, Tanks, Water Wheels, Water Works Plants.



BLOWERS "Sirocco" FANS
TRADE MARK.

Made In Canada

Low cost of Installation, low cost of Operation, low cost of Maintenance, and High Efficiency are the deciding features of "Sirocco."

Engineering Service

Aside from our own Expert Engineers we have at our command the co-operation of the Engineering Service Department of the American Blower Company, and the results of years' of experience of S. C. Davidson, the inventor, Belfast, Ireland.

A "Sirocco" Fan will deliver more air with less power than the ordinary steel plate fan **twice** the size.
"Sirocco" Fans and Blowers are used in connection with apparatus for Heating, Ventilating and Cooling, in Industrial, Educational, Office and Public Buildings.
For Forced and Induced Draft under steam boilers on land and at sea.
The world's largest boats use "Sirocco" Fans for Forced Draft and Hull Ventilation.
The British Navy use "Sirocco" exclusively.

Let us tender on your next air handling problem. The services of our Engineering Department are at your command.

You Should Read "Sirocco" Bulletin No. 3401

Describing and illustrating the construction, operation and application of 'Sirocco' Fans and Blowers.

Write for it today.

CANADIAN Sirocco COMPANY
LIMITED

WINDSOR, ONTARIO.

Sales Engineers:
Clark T. Morse, 301 McGill Bldg., Montreal
E. C. Powers, Room 5, 43 Victoria St., Toronto
W. P. Eddy, 214 Donald Street, Winnipeg
S. S. Clarke, 605 Second St. West, Calgary

BOILER AND STEEL PLATE WORK

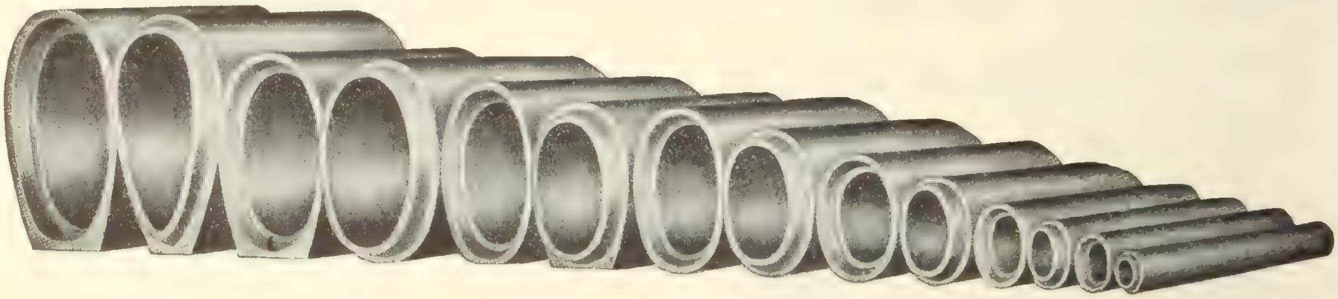
Of All Kinds

We are manufacturers of:—Boilers, Steel Tanks, Smoke Stacks, Ore Buckets, Ore Cars, Steel Flumes, Etc. Any size or style.

Hoisting Machinery a Specialty

Let us quote on your requirements. *All Work Guaranteed.*

MARSH & HENTHORN, LTD., - Belleville, Ont.



Sewers and Culverts

properly built of properly made

- Reinforced Concrete Pipe -

LAST FOREVER.

OUR MATERIAL, SYSTEM and PRODUCT have been tested and approved by EMINENT ENGINEERS. NO RUST, NO ROT, NO FROST-BREAKS, NO PRESSURE-BREAKS, NO HIGH PRICES, NO DELAYS IN PROCURING, NO TROUBLE IN HANDLING.

STANDARD REINFORCEMENT, or SPECIAL if required. Stock sizes 6 in. to 60 in.

Patronize Experienced and Reputable Manufacturers.

Catalogue and prices on application.

Dominion Concrete Company Ltd.

Kemptville, Ontario

EQUIP YOUR CELLAR

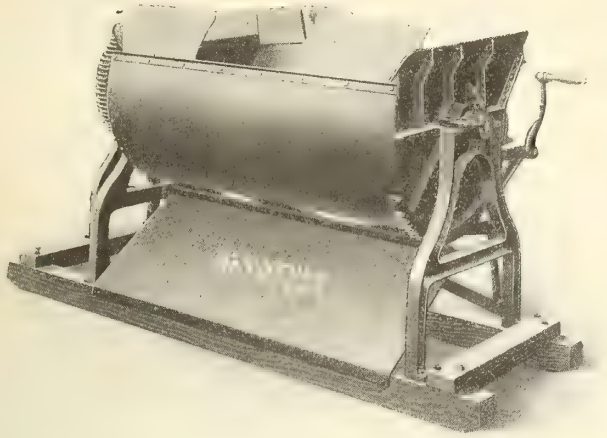
with one of our "Majestic" Coal Chutes which is the neatest and best equipment for any cellar. It is easily installed in either new or old houses. It permits coal, wood or vegetables to be put into the cellar without disfiguring the building in any way. And unlike a glass window it cannot be broken. The hopper can easily be removed if desired to put in very coarse coal or wood, or if a waggon chute is used. It swings back into the chute and allows the door to be closed. The door is made to lock when opened upward, and protects the wall or siding above the chute, and can be released only when closed. We make three standard sizes. There's a size that's just right for your cellar and your requirements. No. 1—22 x 16 x 13. No. 2—27 x 16 x 13. No. 3—33 x 22 x 18.

Send for our illustrated booklet, it shows and describes our full line of Coal Chutes

The Galt Stove & Furnace Co., Limited, GALT, ONT., CAN.

Toronto Representatives: Black Building Supply Co., Mail Building
Montreal Representative: E. F. Dartnell, No. 8 Beaver Hall Square
Gorman, Clancey & Grindley, Agents, Calgary and Edmonton, Alberta

Time Saved in Concrete Mixing



The Blystone Skid Mixer

Every movement of this mixer is calculated to save time. The mixing is quick and thorough and the dumping, worked by the handle on the right will save moments at every batch turned out. Strongly built—all working parts carefully balanced.

The Blystone Machinery Company
61 Railroad St., CAMBRIDGE SPRINGS, Pa., U.S.A.

Full line of Blystone Mixers carried in stock by
The A. R. Williams Machinery Co., Limited, Toronto, Ont.
N. J. Dinnen & Co., Limited, Winnipeg, Man.
Gorman, Clancy & Grindley, Calgary, Alberta.
Ritchie Contracting & Supply Co., Vancouver, B.C.

"Metallic"

Steel Ceilings and Walls

How many kitchens and bathrooms are there in your locality? Every one of them ought to be furnished with "Metallic" Steel Ceilings and Walls; and this certainly offers you a splendid opportunity to get a lot of profitable business.

These fire-proof ceilings and walls are inexpensive, are sanitary and easy to clean. You don't have to carry them in stock; our catalogue H and price list is all you need.

Send for them now

THE METALLIC ROOFING CO.
OF CANADA LIMITED,
TORONTO AND WINNIPEG

Contractors' Acetylene Flare Lights

Made in Two Sizes

SIZE NO 1—

8,000 Candle Power, operates 12 Hours on 18 lbs. Carbide.

Price F.O.B. Ottawa $95.00.

SIZE NO. 2—

1,000 Candle Power, operates 12 Hours on 8 lbs. Carbide.

Price F.O.B. Ottawa $65.00.

Manufactured by

International Marine Signal Co.
Limited
Ottawa, Canada

Used Machinery and Contractors Plant

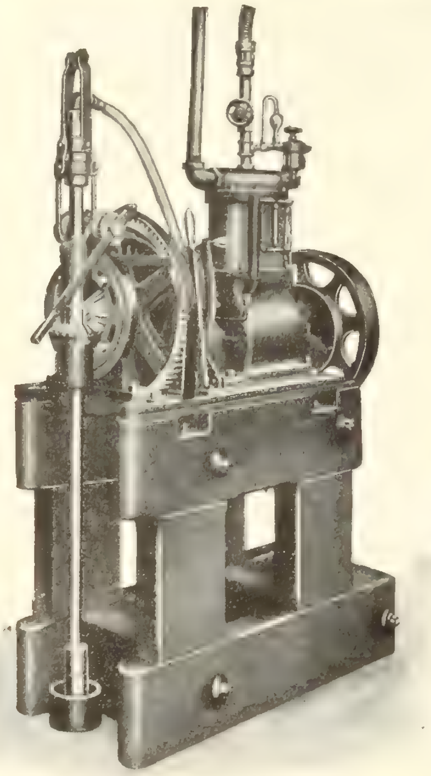
FOR SALE

1—40 H.P. Stationary Boiler and Engine
1—80 H.P. Tubular Boiler
2—60 H.P. Tubular Boilers
1—50 H.P. Tubular Boiler
1—2 Yard Ore Car
1—1/2 Yard Milwaukee Concrete Mixer (New)
1—30 H.P. D.D. Electric Hoist
1—No. 4 Champion Stone Crusher
1—No. 5 Pulsometer Pump (New)
2—6x5 3/4x6 Duplex Pumps
1—Stone Elevator for No. 5 Austin Crusher
1—20 H.P. Upright Boiler
3—2 H.P. Electric Motors, A.C.
1—14 H.P. White Traction Engine
1—25 H.P. Portable Boiler and Engine

The above machines are but slightly used and are in good working order.

Fleming Machinery Company
340 Sparks Street, Ottawa, Can.

McKiernan-Terry Core Drills



CLASS "A" DRILL.

The only Light-Weight, Self Contained, Direct Connected, High Speed Shot Drill on the Market.

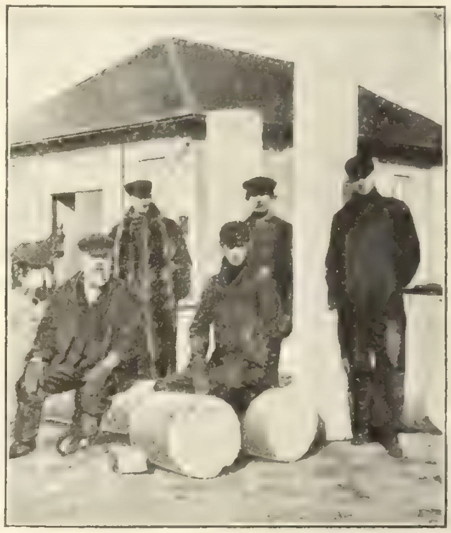
Class "A" takes out cores up to 3 in. in diameter to a depth of 500 feet.

This machine is capable of boring holes at angles as flat as 45 degrees.

In ordinary hard formations the work can be done for a cost not exceeding $1.25 per foot. In soft formations as low as 60c. per foot.

In any rock the McKiernan-Terry Shot Drill will take out a larger core for less per foot than the old-fashiond Diamond Drills.

The 16 in. hard limestone cores shown here were taken out by one of our Type "C" McKiernan-Terry core drills operated by the Corporation of Winnipeg.



We can furnish machines for taking out cores up to 30 in. in diameter.

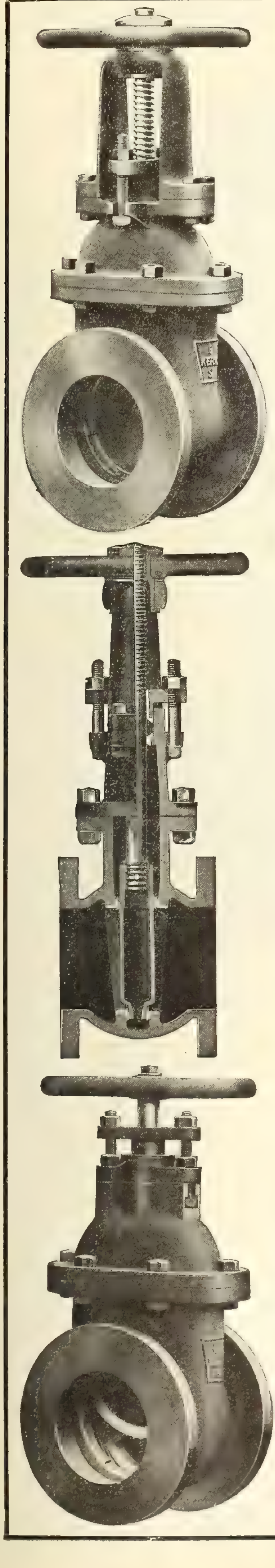
We carry a full line of spare parts and drilling tools at all our District Offices.

CANADIAN ALLIS-CHALMERS, LIMITED

Manufacturers of:—Air Compressors, Boilers, Cement Making Machinery, Concrete Mixers, Flour Mill Machinery, Gas Engines, Hoisting Engines, Hydraulic Machinery, Ornamental Metal Work, Rock Crushers, Rock Drills, Saw Mill Machinery, Steam Pumps, Steam Specialties, Steam Turbines, Structural Steel Transmission Machinery, Turbine Pumps, Water Wheels.

Head Office: TORONTO

District Sales Offices: Montreal, Halifax, Ottawa, Cobalt, Porcupine, Fort William, Winnipeg, Regina, Saskatoon, Calgary, Edmonton, Nelson, Vancouver, Victoria, Prince Rupert



The **KERR**

"Keystone"

Iron Body

GATE VALVES

are not surpassed by any other gate valve in **Design, Quality** of material, **Durability, Workmanship,** and up-to-the-minute requirements.

They have been designed and are built to meet the specifications of the most exacting and critical Engineers, and will bear the rigid scrutiny of "THE MAN WHO KNOWS."

If you are particular about the valves you specify or buy, you will not only **specify, but demand Kerr (Keystone) Iron Body Gate Valves.**

Any **Kerr Valve** lends class and distinction to any steam or water job.

Manufactured and Guaranteed by

The

KERR

Engine Company

Limited

WALKERVILLE, ONT.

VALVES
and HYDRANTS
exclusive output.

Protect Your Buildings As Well as Insure Them!

Prevention of fires is vastly better than the partial redress which is all the best Fire Insurance Policy can give you. This prevention is easily secured by using

Asbestocement Building Materials

TRADE MARK
ASBESTOSLATE
ASBESTOS
SHINGLES

make roofs that are handsome, *fireproof,* practically everlasting and moderate in price.

Linabestos Building Board

prevents inside fires from spreading. It is quickly applied, and gives a permanent, attractive, yet inexpensive interior finish.

Asbestos Corrugated Sheathing

makes walls and roofs for Garages, Stables, Barns, Warehouses and Factories that are absolutely ***weather and fire proof.***

You build for all time when you build in Asbestocement.

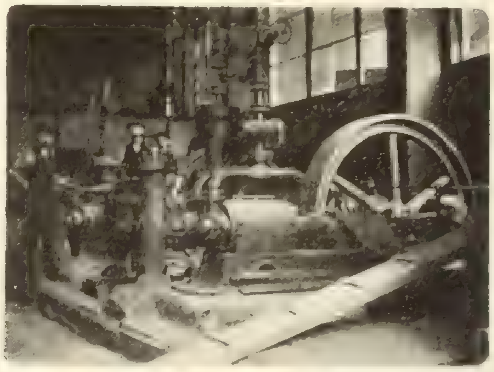
Write for Booklet **C. R.** and state in which products you are particularly interested.

Asbestos Mfg. Co., Ltd.

Address—E. T. Bank Bldg., 263 St. James St.
MONTREAL
Factory at Lachine, P.Q. (near Montreal)

THE LINDE BRITISH REFRIGERATION COMPANY LIMITED

has the largest output in the world of refrigerating machinery.



Plant in course of construction at Windsor Station

A RECENT INSTALLATION—C. P. R. WINDSOR ST. STATION

The largest contract for installation of refrigerating plant in any hotel or railway station in Canada

Established in Great Britain 27 Years. *Established in Canada 18 Years.*

Operating in every country in the world, with plants or distributing offices at

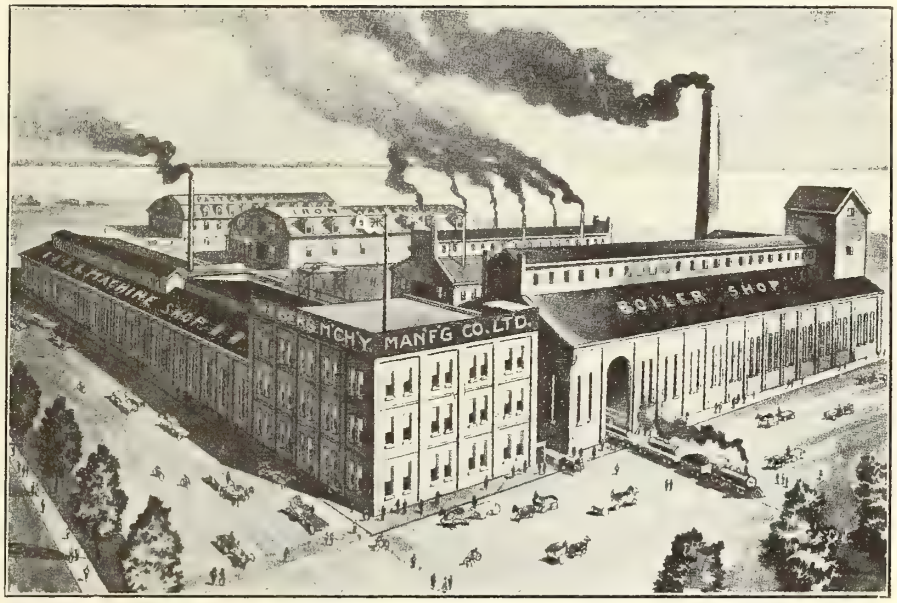
Liverpool
Birmingham
Glasgow

Bristol
Bombay, Ind.
Calcutta, Ind.

Sydney, N. S. W.
Port Napier, N. Z.
Johannesburg, S. A.

HEAD OFFICE :
LONDON, ENG.

CANADIAN OFFICES
CORISTINE BLDG
MONTREAL



The Berg Plant at Toronto

Berg Boilers

Our prices are right and our shipments prompt for every kind of boiler and plate work : : : : : : : :

Water Tubes

Horizontal Return Tubular
Fitzgibbons, Scotch Marines,
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Steel Water Towers, Tanks and Heavy Plate Work.
Cast Iron Columns and Bases. Post Hangers

The Berg Machinery Mfg. Co., Limited

Boiler Department

Bathurst and Niagara Sts. TORONTO, ONTARIO

No Guess Work

About Luxfer Prisms

THE Luxfer system of conveying light by glass prisms is an exact science which is being proved daily in thousands of stores, offices and warehouses in every city in Canada.

Some of the cleverest refractionists of the country are with our organization and their skill and experience is at the disposal of our customers.

If you have a lighting problem—bring it to us and we will show you how it can be solved.

LUXFER PRISM COMPANY, Limited

100 King Street West, TORONTO

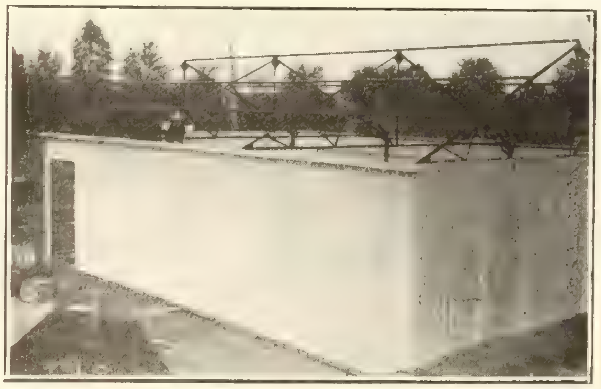
Storage Houses Oil Houses

¶ We have the best possible facility for making all kinds of storage houses of one storey, no matter of what dimensions.

¶ We will undertake to furnish and erect such buildings complete ready for occupancy.

¶ No steel building is too small or too large for us to figure on.

¶ We shall be pleased to furnish estimates and sketches on this class of work at any time. Write us and tell us what you need and we will prepare estimates for you at once.



Cut shows an all-steel building used for storing expensive patterns and dies. The size of this is 18′ x 39′ and it has been doing service for years and gives the same good service as when erected.

The Metal Shingle & Siding Company, Ltd.

Associated with

The A. B. Ormsby Company, Limited

Montreal, Toronto, Preston, Winnipeg,
Saskatoon, Edmonton, Calgary.

Advance Information

About Building Operations, Engineering Projects, Municipal Improvements and all lines of Construction Activities.

MacLean Daily Reports give the building and engineering news of all Canada from one coast to the other—and give it daily and accurately in readily available form. If there is an office building to be erected in Winnipeg, an apartment block in Calgary, a bridge in Vancouver, or a residence in a new town just breaking out on the map, you can find out all about it in MacLean Daily Reports—specifications, estimates of cost and the names and addresses of owners and designer. The contractor, the building supply and specialty dealer and every one who must keep in close touch with the construction business in any or all of its branches cannot afford to be without a daily knowledge of all that is new in his territory. Competition makes this compulsory. The one sure way to this knowledge is the MacLean Daily Reports service.

Every morning our clients find on their desk a readily available mass of information selected to their requirements—specialized advance news of interest and of hard dollar and cents value. Don't give your competitor this leverage. Use it yourself.

If you will send your name and address we shall consider it a pleasure to mail sample reports and literature for your leisurely consideration. This will involve not the slightest obligation on your part. We wish to show you the value of our daily report system and give a few sound reasons why—when you are ready—it will pay you to use our service as an aid in following the business offering you throughout Canada.

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NATIONAL PIPE & FOUNDRY CO., LIMITED

WATER WORKS CONTRACTORS

MANUFACTURERS OF

WOODEN WATER PIPE

For water works systems, domestic water supply and hydraulic mining. Insulated wire conduits; steam pipe casings; acid-proof pipe for mines, tanneries and pulp mills. Sizes from 2 inches to 24 inches.

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Successors to

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Manufacturers of

Bridges—Steel Buildings
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Towers—Girders and
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of all kinds

Estimates Furnished Promptly

Large Tonnage of Plates, Shapes and Bars in Stock

Office and Plant, New Glasgow, N. S.

MR. CONTRACTOR!

Are You Aware That

GRAVEL stands third in the list of materials for concrete work according to tests made by the American Society of Civil Engineers; being surpassed only by Trap Rock and Granite.

GRAVEL is cheaper than any other good concrete base.

GRAVEL can be handled for 25% less than any other material.

GRAVEL is easier on your mixers.

GRAVEL goes farther and costs less to set up than concrete made of any other material.

If you are not aware of these facts, you should be, they mean much to you.

SAND & SUPPLIES, LIMITED

Phones: Adelaide 1947-1948

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Manufacturers

Flexible and Flange Pipe, Special Castings and all kinds of Waterworks Supplies.

3 inches to 60 inches diameter

for Water, Gas, Culvert and Sewer

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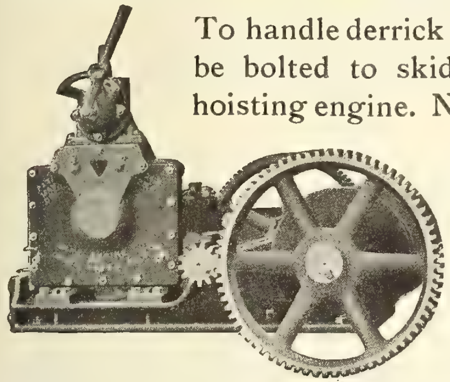
Iron Ore, Pig Iron, Car Wheels, Cast Iron Water and Gas Pipe, Specials, Valves, Hydrants, etc., Castings of all kinds, Mooring Bollards for both Concrete and Wooden Docks, Hoisting Machinery.

The Dake Swinging Gear

To handle derrick booms. Can be bolted to skids in front of hoisting engine. No dead center.



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"Queenston Blue" Limestone

Send us your specifications for Cut Stone work

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for Interior Construction

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Toronto - Canada

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every size for Water, Gas, Culvert or Sewer, Carried in Stock

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MEXICAN ASPHALT

HERKIMER ST., HAMILTON. Paved with our Mexican Asphalt.

Write for analysis and samples

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Asphalt & Supply Company, Limited
Sole Canadian Agents for the Mexican Eagle Oil Co.
Also Agents for MASTIC ASPHALT for Sidewalks.
428 Transportation Bldg., MONTREAL

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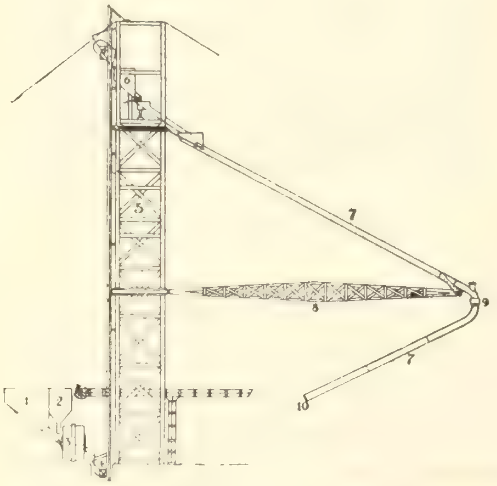

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Information gladly furnished and Estimates given on any work.

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Eastern Representatives
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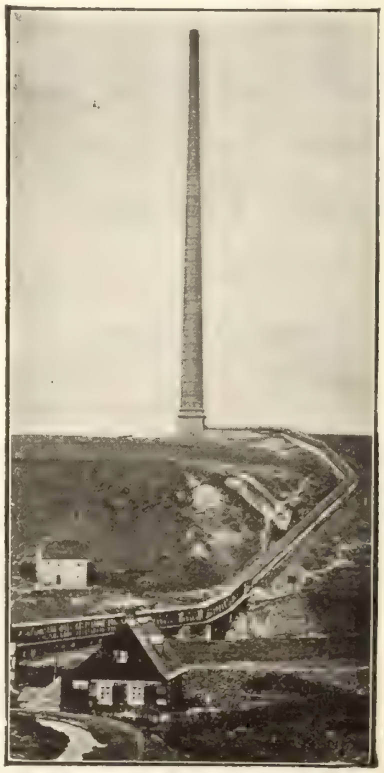

460 feet x 8 feet 2 in.

World's Largest Chimney

Radial Brick chimneys are the only type that will not deteriorate from the effects of gases and erosion.

HEINICKE CHIMNEYS

will be found proving their superiority to over 4,000 users in every part of the country. The day of common brick and metal stacks is gone—if you are building a chimney make it a HEINICKE.

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H. R. HEINICKE, INC. New York, U. S. A.
Representatives for Canada:
Black Building Supply Co,, Ltd. Toronto
Dartnell Ltd., Montreal Que.

Current Prices of Building Material

BRICKS

The following are wholesale prices delivered at Toronto:—

	Per M.
No. 1 dry pressed red brick	$18 00
No. 1 dry pressed buff brick	18 00
Red Stock Bricks	13 00
Grey Stock Bricks	13 00
Wire cut bricks for foundation work ...	12 50
Porous terra cotta bricks	15 00
No. 1 enamelled bricks, all colors, from ... ... $80 00 to	$150 00
Sand-Lime Bricks	11 00

LUMBER (Building Material)

Hemlock Lumber—		
2 in. x 4 in. to 2 in. x 12 in., 8 to 14 ft.	$26 00	
2 x 4 to 2 x 12, 16 ft.	26 00	
2 x 4 to 2 x 12, 18 ft.	29 00	
1 in. Hemlock, No. 1	25 00	27 00
No. 1 Hemlock Decking	25 00	27 00
No. 2 Hemlock dimension and 1-in.	19 00	21 00
Pine—		
1 in. common pine 8 to 12 in. wide rough	27 00	30 00
2 in. white pine Bill stock	29 00	33 00
⅞ x 8 and 10 in. pine shelving..	36 00	42 00
⅞ x 12 in. pine shelving	45 00	
No. 1 white pine flooring	33 00	
No. 1 spruce flooring	28 00	
No. 1 pine decking D2S	30 00	
Spruce Decking	28 00	
No. 1 pine V. or headed sheeting	36 00	
No. 2 pine V. or beaded sheeting	32 00	
Pine trim for paint finish—		
4 in. casing per 100 ft.	2 00	
5 in. casing per 100 ft.	2 50	
8-in. pine base, per 100 ft.	3 50	
10 in. pine base, per 100 ft.	4 50	
4 in. pine window stool	2 75	
Shingles—		
XXX B. C. Clear Shingles, per M.	3 90	
N. B. Extras	3 75	
N. B. Clears	3 10	
No. 1 pine lath, per M.	5 00	
No. 2 pine lath	4 50	
No. 1 spruce lath	4 00	
Cedar Posts—Fence—		
5 in. at small end, each	30	
7 in. at small end, each	35	
Hemlock lath	3 50	
Dimension Timber up to 32 feet:		
8x8, 10x10, 10x12, 12x12, 12x14		32 00
8x10, 8x12, 10x14, 14x14		34 50
8x14, 12x16, 14x16, 16x16		34 50
10x16, 14x18, 16x18		35 50
8x16, 12x18, 18x18		36 00
10x18, 14x20, 16x20		36 50
8x18, 12x20, 18x20		37 00
10x20		37 50
8x20, 14x22, 16x22, 18x22, 20x22, 22x22		38 50
12x22		39 00
10x22		39 50
8x22, 14x24, 18x24, 20x24, 22x24, 24x24		40 50
12x24		41 00
10x24		41 50
8x24		43 50

WINDOW GLASS

Following are the prices of glass at Toronto, Hamilton and London. The discounts are 15 per cent. for Star and 15 per cent. for D.D.

	Star	D.D.
10 to 25 united inches	$4 25	$ 6 25
26 to 40 "	4 60	6 75
41 to 50 "	5 10	7 50
51 to 60 "	5 35	8 50
61 to 70 "	5 75	9 75
71 to 80 "	6 25	11 00
81 to 85 "	7 00	12 50
86 to 90 "		15 00
91 to 95 "		17 50
96 to 100 "		20 50
101 to 105 "		24 00
106 to 110 "		27 50

The following are wholesale prices for glass at Montreal and jobbing prices at Winnipeg for box lots:—

MONTREAL

	Star	D.D.
25	$3 25	$4 75
40	3 45	5 20
50	3 85	6 00
60	4 10	6 50
70	4 35	7 00
80	4 85	7 50
90		9 75
95		10 75
100		12 50

Net prices per 100 feet F.O.B. Montreal.

WINNIPEG

	4ths Single	3rds Double
Up to 25 u.i.	$3 50	$5 00
26/40	3 75	5 50
41/50	4 25	6 25
51/60	4 75	7 00
61/70		8 00
71/80		9 00
81/85		10 00
86/90		11 00
91/95		13 00
96/100		16 00

Net prices per 100 ft. F.O.B. Winnipeg.

STEAM FITTERS' AND PLUMBERS' SUPPLIES

Standard compression work, 60 per cent.

High grade compression work, 55 and 5 per cent.

Fuller work, 65 and 5 per cent.; No. 0, 70 and 10 per cent., and 1 and 2 basin cocks, 70 per cent.

Flatday stop and stop and waste cocks, 60 and 10 per cent.; roundway, 60 and 5 per cent.

No. 4 compression bath cock ...... net$1.85

No. 4½ Fuller's .... net$2.50

Square head brass cocks, 65 per cent.

Lead Pipe

Lead pipe, $7.50; less 5 per cent.; lead waste, $9.00, less 5 per cent.; caulking lead, 7 cents per lb.; traps and bends, 40 per cent.; pig lead, 5¾ cents per lb.

Iron Pipe

Size (per 100 ft.)	Black		Galvanized
¼ inch	$2.28	¼ inch	$3.18
⅜ "	2.28	⅜ "	3.18
½ "	2.72	½ "	3.57
¾ "	3.28	¾ "	4.43
1 "	4.85	1 "	6.55
1¼ "	6.56	1¼ "	8.86
1½ "	7.84	1½ "	10.59
2 "	10.55	2 "	14.25
2½ "	16.67	2½ "	22.52
3 "	21.80	3 "	29.45

Cast iron fittings, 65; headers, 65; flanged unions, 70; malleable bushings, 67½; nipples, 4-inch diameter and under, 75 and 10; nipples, 4½-inch and up, 70 and 10; malleable lipped unions, 67½ per cent.

Soil Pipe and Fittings

Medium and extra heavy pipe and fittings, up to 6-inch, 60 and 5 per cent.

7 and 8-inch pipe, 45 per cent.

Sewer Pipes

4-in.	25c ft.	15-in.	1.35 ft.
6-in.	40c ft.	18-in.	1.90 ft.
9-in.	65c ft.	20-in.	2.25 ft.
12-in.	1.00 ft.	24-in.	3.25 ft.

all less 65 per cent.

CEMENT, STONE, STEEL, Etc.

Cement, barrel lots, in bags, delivered, Toronto, bags, extra, $1.80.

Cement, wholesale, car lots, f.o.b. Toronto, bags extra, $1.55.

Crushed stone, 2-inch, $1.40; 1-inch, $1.45; ⅜-inch, $1.45.

Burnt River rubble stone delivered, $17 to $18 per toise.

Plain steel bars, $2.25.

Square twisted bars, ¾ to 1¼, $2.35.

Malleable fittings — Canadian discount, 40 and 42½ per cent.

Free stone delivered, $17 to $18 per toise.

Brown coursing stone, delivered, $3.75 per yard.

Grey coursing stone, delivered, $2.50 to $2.75 per yard.

Sand, for cement or brick work, $1.15 a cubic yard, f.o.b. Toronto, C. P. R. siding.

Sand, for cement or brick work, 90c to $1.05 a cubic yard, f.o.b. Toronto, G. T. R. sidings.

Brown sills and heads, in the rough, delivered, 40 cents per foot.

Rubble stone in car lots, $1.40 per ton.

Steel channels and beams, angles and plates, $2.65 to $3.00 per 100 pounds, delivered f.o.b. Toronto.

Hard Wall Plaster, unsanded, from $7.00 to $8.50, bags extra; sanded, $4.00 in car lots; hydrated lime, $10.00 in car lots.

Lime per cwt., delivered, not less than 1,500 lbs. 33 cents; white, 43 cents.

Plaster of Paris, Anchor and Crown Brands, $1.50.

Manilla Rope, best, per pound, 12½ cents.

PAINTS AND OILS

Pure White Lead, ground in oil, $8.40 per 100 lbs

Boiled Linseed Oil in bbls., 67c per gal of 9 lbs.

Raw Linseed Oil, in bbls., 64c per gallon.

Pure Red Lead, dry, $7.00 to $8.00 per 100 lbs.

Putty, pure linseed oil, in bulk, bbls., 3½c.

Putty, pure linseed oil, in 25-lb. tins, 4c.

Argenteuil Granite Co., Limited
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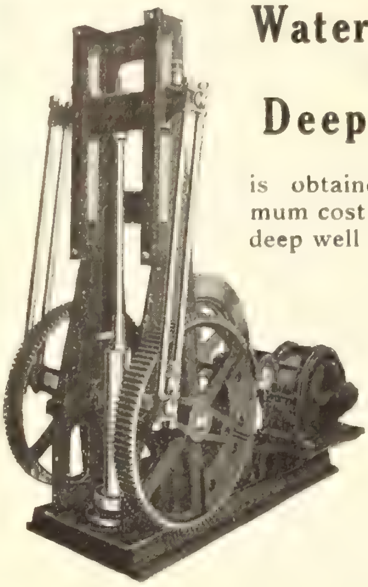
We are in the market to bid on your plans for granite on buildings.

Our up-to-date cutting plant, excellent quarries and good shipping facilities enable us to make close prices.

SEND US BUILDING PLANS TO-DAY



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is obtained at a minimum cost by use of our deep well pumps.

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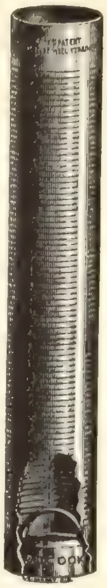

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"Bradford
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(Trade Mark Reg. U.S. Pat. Office)

The merits of Bradford Red Brick are due to the peculiar natural qualities of the famous Bradford Shale, backed up by twenty years of progressive methods in brick making.

A BEAUTIFUL non-fading, natural red—classy, distinctive, impervious and pressed; quality in every atom, merit in every molecule.

If you want to know more about this rich, red, right-all-through aristocrat of bricks, write for the Bradford Red Book *at once.*

Bradford Pressed Brick Co.
"The Red Brick People"
Bradford, Pa.
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STRUCTURAL STEEL FOR QUICK DELIVERY

We carry in stock at Montreal, 5,000 tons of Structural Shapes and are in a position to make quick shipment of either plain or riveted material for

Bridges, Roof Trusses, Columns, Girders, Beams, Towers and Tanks, Penstock.

Estimates furnished promptly. Capacity 18,000 Tons Annually.

Structural Steel Co., Ltd.
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Engines and Boilers

of all types and sizes, Heaters, Tanks, Pumps, etc.

E. Leonard & Sons LONDON ONT.

AGENTS:

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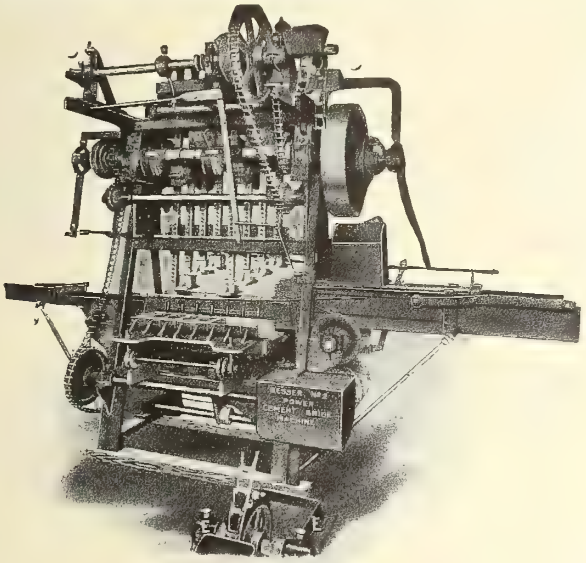
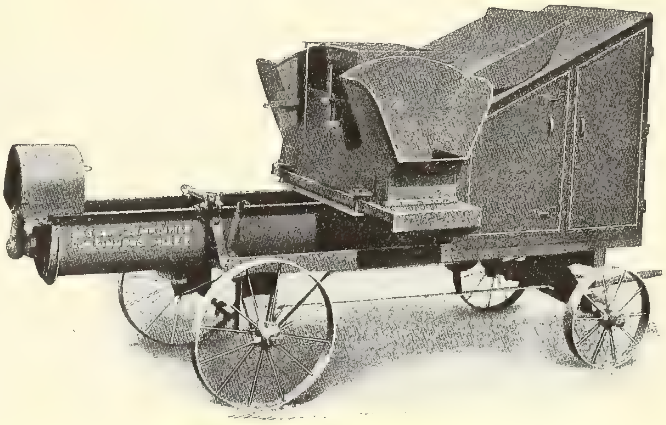
Here are the two Besser machines that make the best cement brick on the market. The Brick machine that will make 30,000 bricks per day—every brick the same.



Besser Power Cement Brick Machine

Woodstock Wind-Motor Co., Ltd.
WOODSTOCK, ONTARIO



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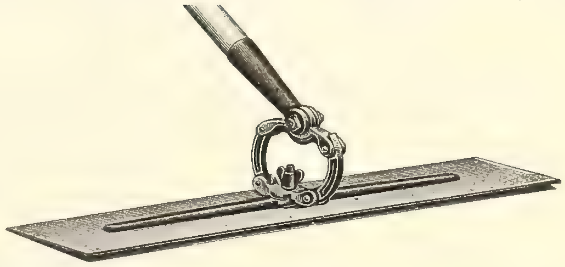

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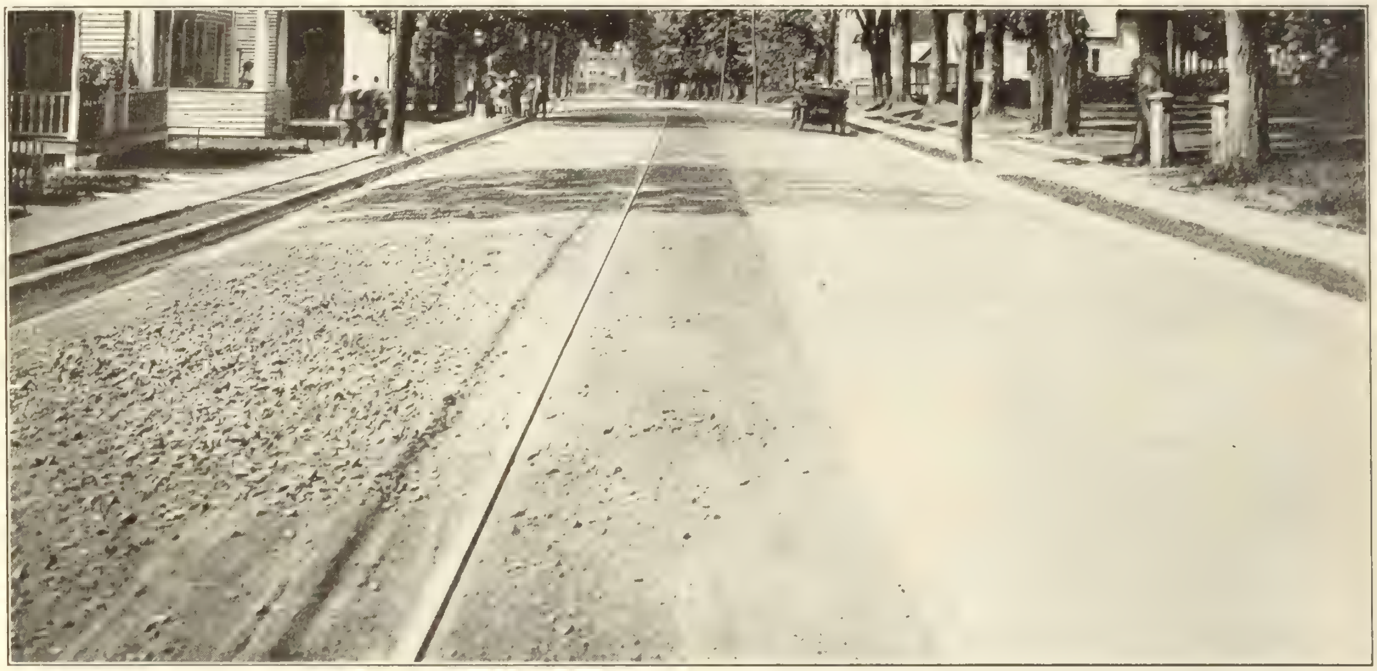
Bermudez Road Asphalt

"It Stays Put"



MAIN STREET, HOOSICK FALLS, NEW YORK

This side laid, 1910, with "Just-as-good-as-Bermudez." This side built with Bermudez Road Asphalt. Laid in 1910. Photo 19 .

Bad Roads Cost Most—Good Roads Cost Least

What often happens when inferior road materials are employed is strikingly shown in this picture.

It is a photograph just made of Main Street, Hoosick Falls, N.Y.

The roadway on the right of the car track was built with Bermudez Road Asphalt in 1910.

The roadway on the left was put down at the same time with one of the materials that are said to be "just as good as lake asphalt." But unlike the Bermudez, it did not stay put.

A lot of money was wasted here. The cost of the bad road, which must be rebuilt, will be at least twice what Bermudez construction would have cost. Not much economy in that.

In fact the most expensive roads are always the bad roads.

Good roads built with Bermudez cost less, life and maintenance considered, than any other form of bituminous construction.

Reasons why Bermudez roads last longest and are most satisfactory all of the time are given in the Bermudez Road Book in language that any one can understand. It is worth writing for today.

The Barber Asphalt Paving Co.

PHILADELPHIA, PENN.

Cap. 75000 gals. Height 85-ft.
Canadian Car and Foundry Co., Montreal

Canadian Plant

Chicago Bridge & Iron Works

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We also design, manufacture and construct Oil Tanks, Coaling Stations, Bridges, Turntables, Buildings and Structural Material.

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SHOPS—BRIDGEBURG, ONT., CAN.
Chicago, Ill., U.S.A.
Greenville, Penn., U.S.A.

Grand Trunk Pacific Ry.
Lines West of Winnipeg

The New Technical High School, Toronto. To be cleaned by a TUEC 8 sweeper plant.

To be

Cleaned By TUEC

The Ideal Stationary Air-Cleaning System

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Tuec Co. of Winnipeg—419 Portage Ave., Winnipeg, Man.
Tuec Co. of Calgary—165 Sixth Ave. W., Calgary, Alta.
Tuec Co. of Montreal—406 New Birks Bldg., Montreal, Que.

Canadian Factory—
B.O.T. Bldg. 159-61 Richmond St. W., Toronto
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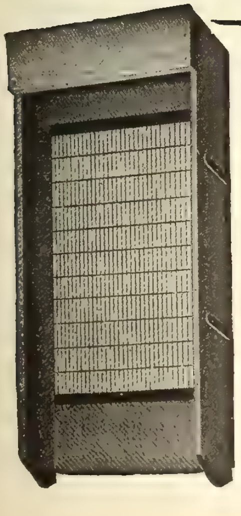

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SAND and GRAVEL SCREENS

We make **SCREENS** for all purposes

Concrete Reinforcement, Window Guards, General Wire and Ironwork.

Shall be pleased to quote you.

Canada Wire & Iron Goods Co.
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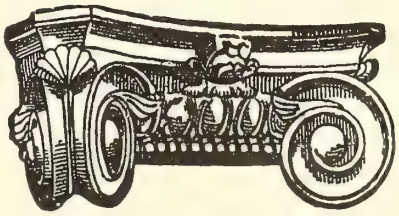
Our Patent Wainscot Cement



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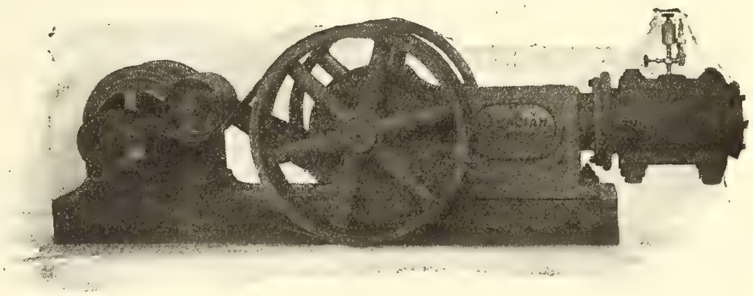

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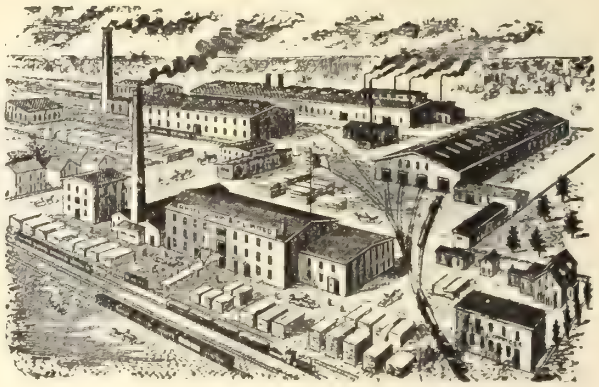

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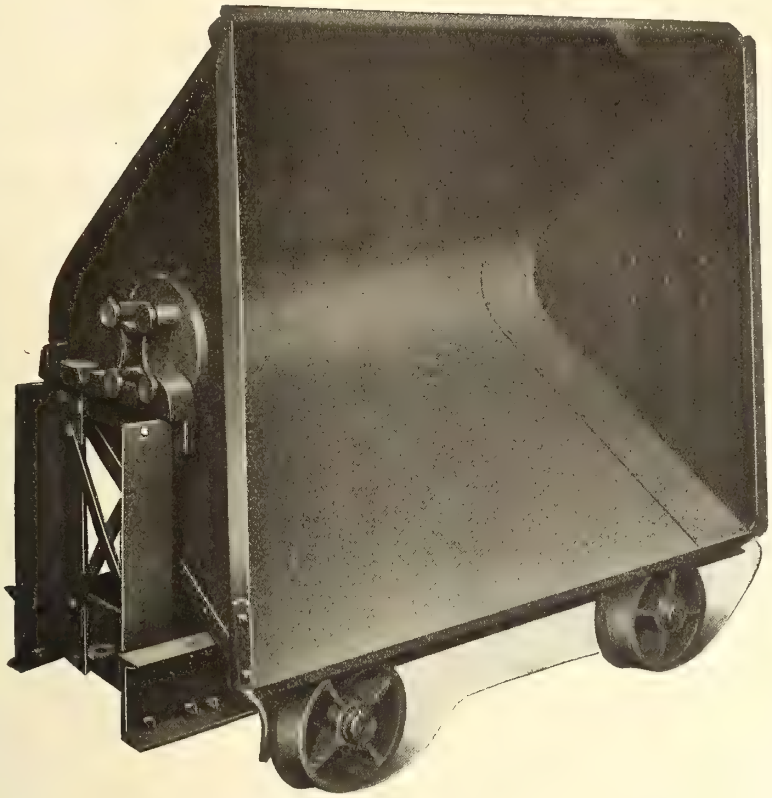

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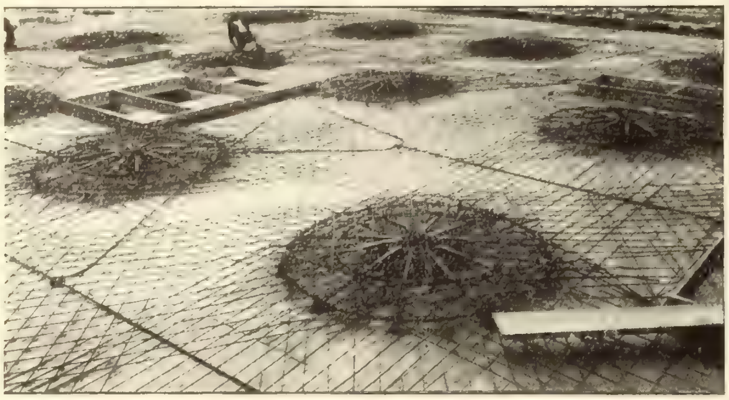

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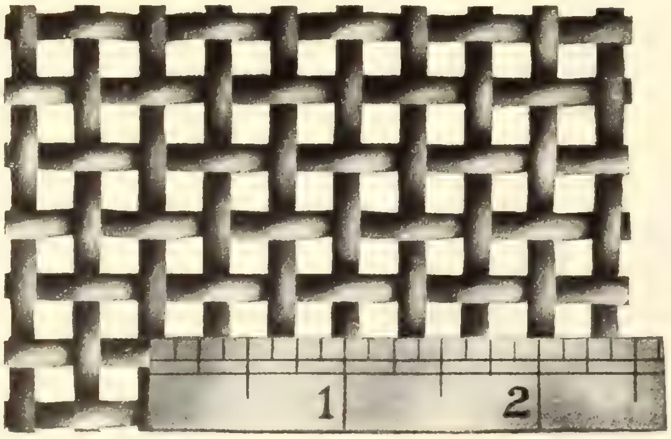

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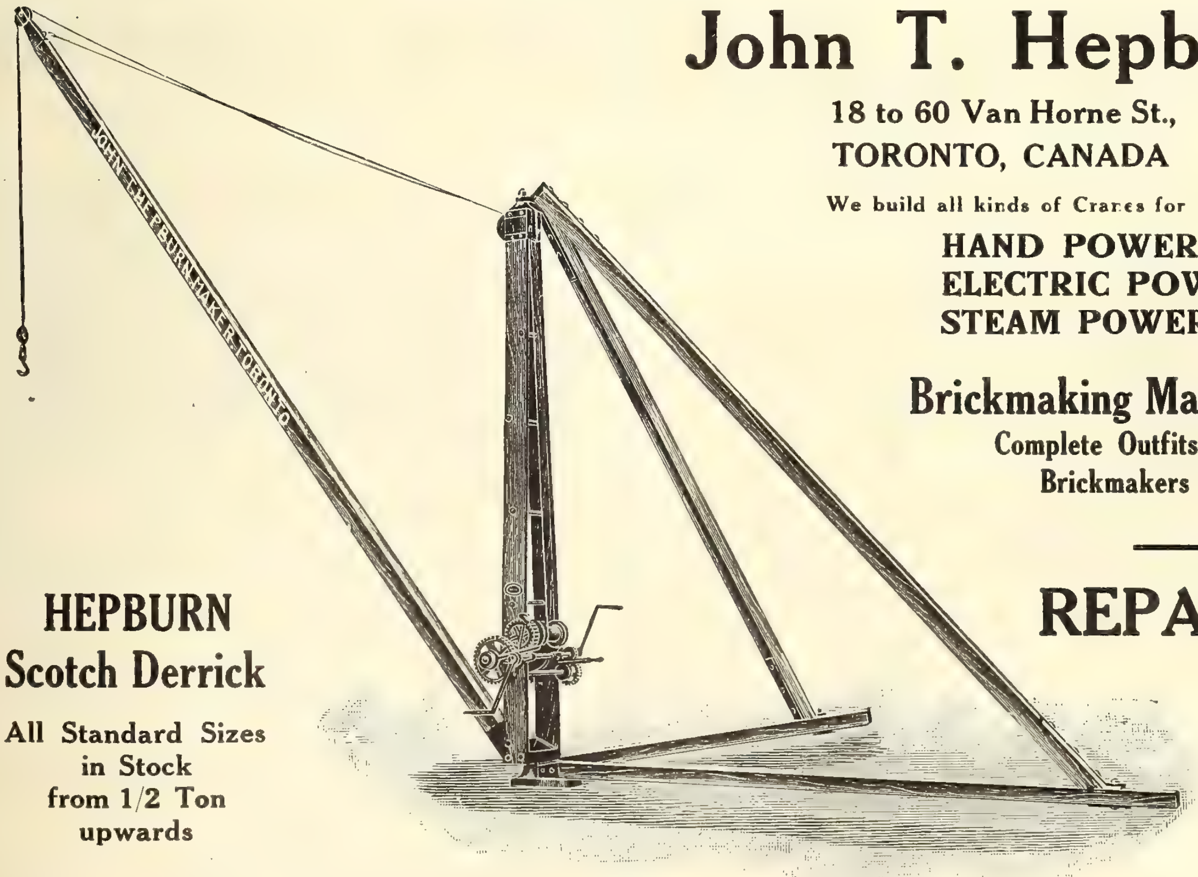
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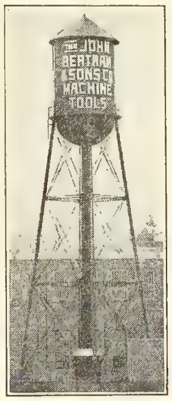

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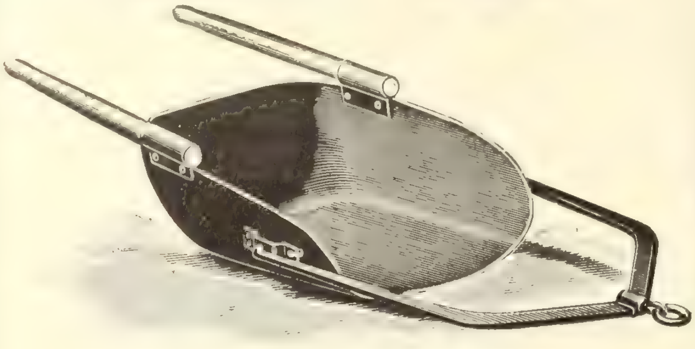

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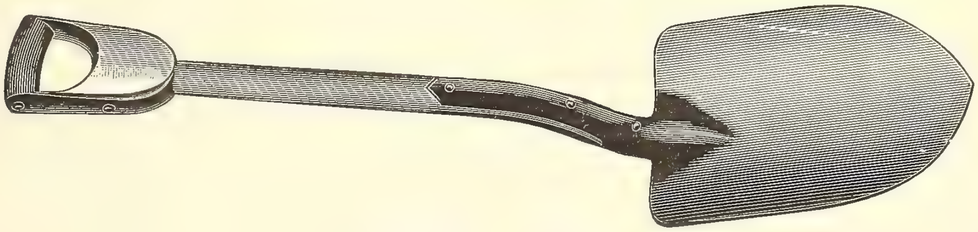

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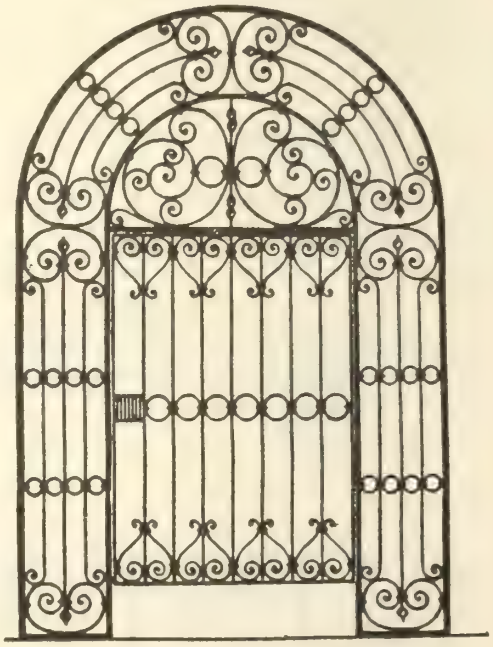

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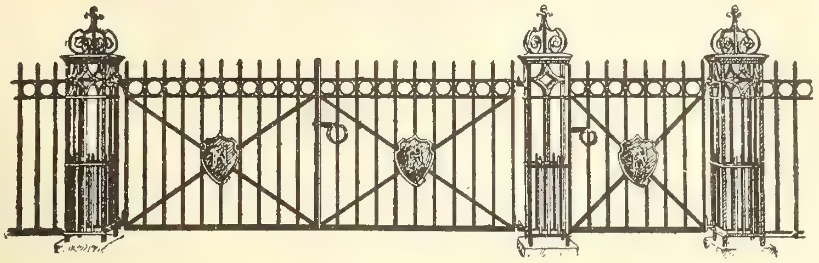

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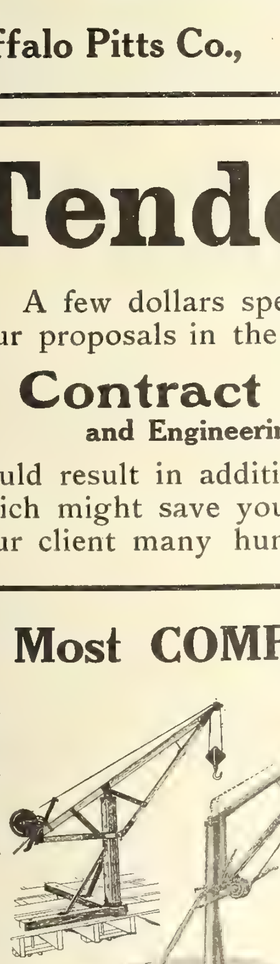

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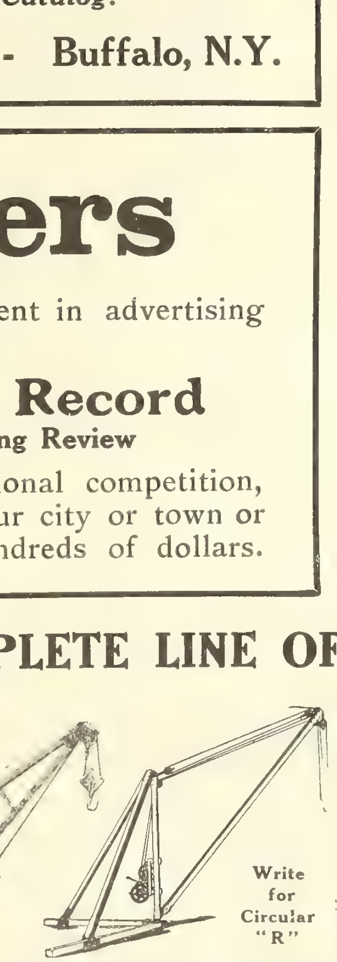

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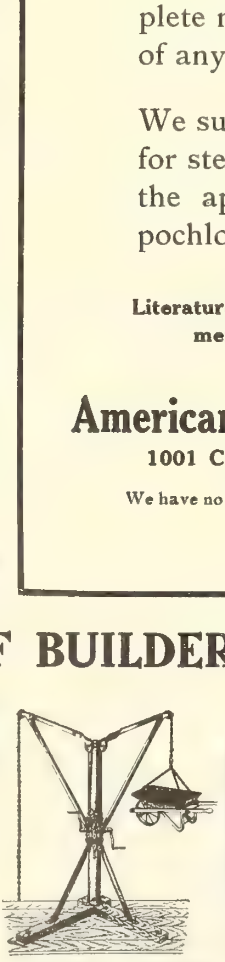

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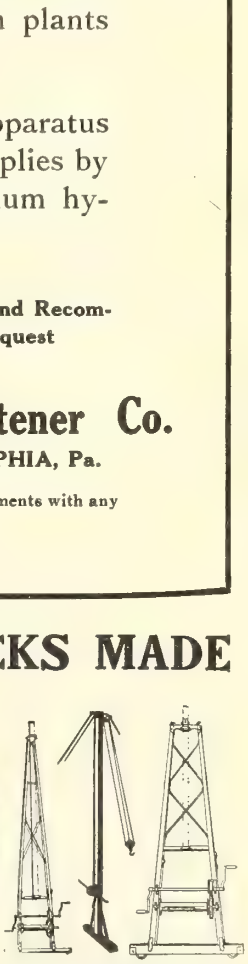

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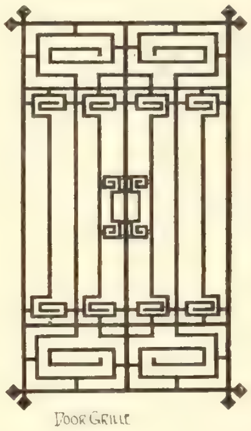

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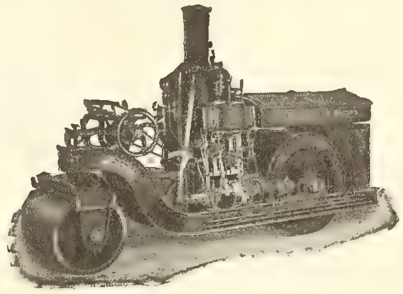

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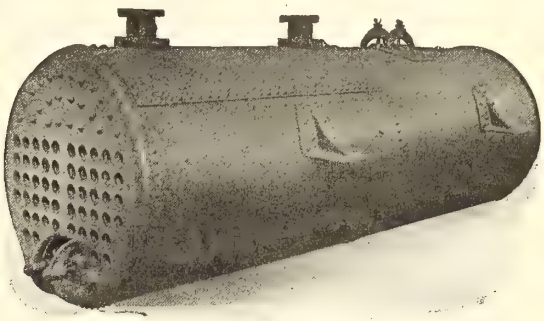

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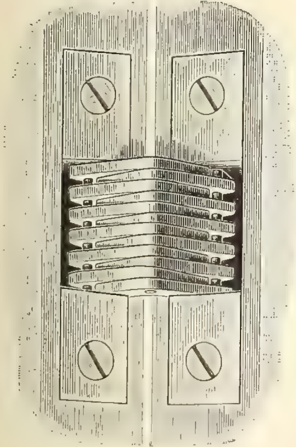

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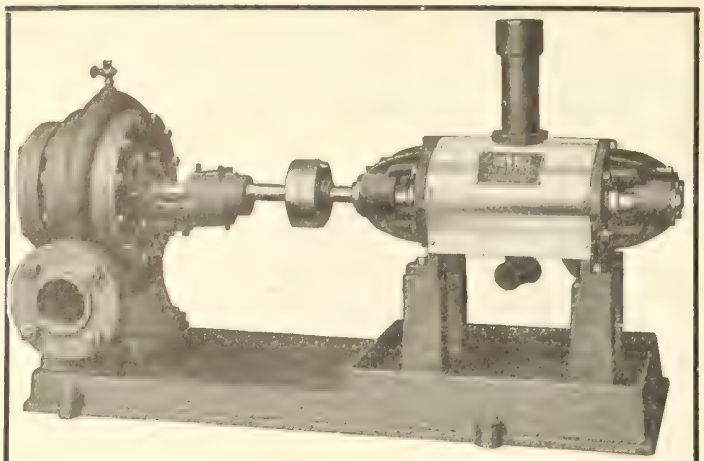

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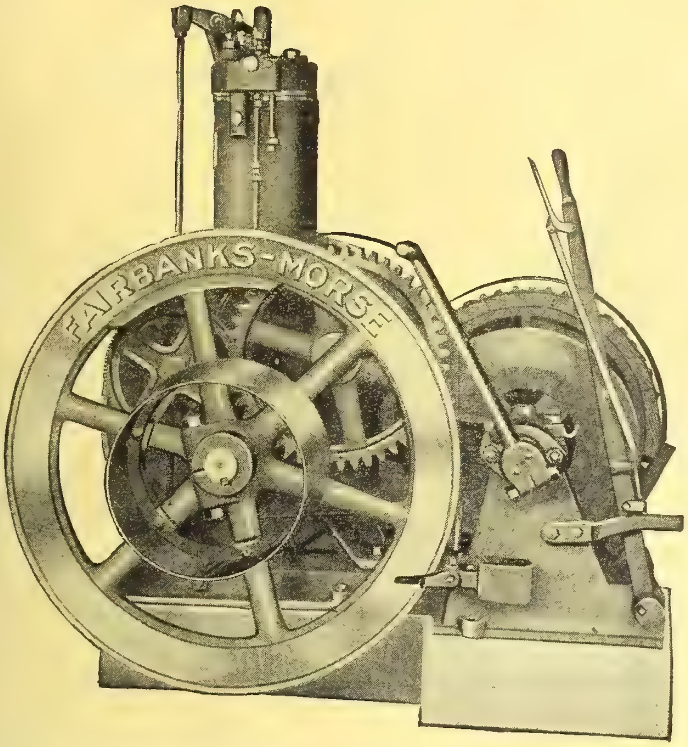

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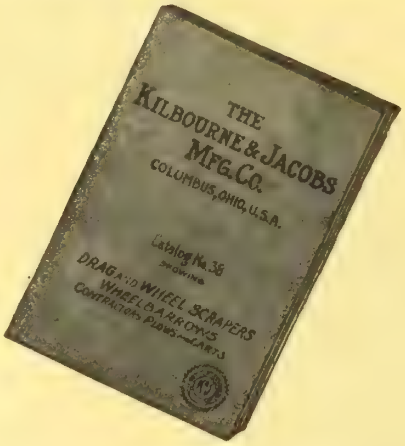

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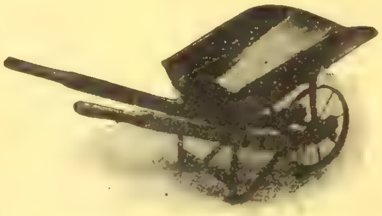

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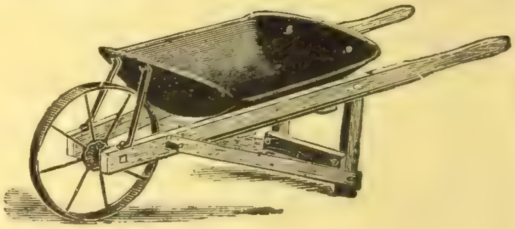

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